Appliance fixes that save cash — big cash!

The Family Handyman

November 2005

perfect trim

Super-smooth finishing
Trim tricks of fussy carpenters
Dramatic wainscoting

Cure clutter with our storage bench and coat rack

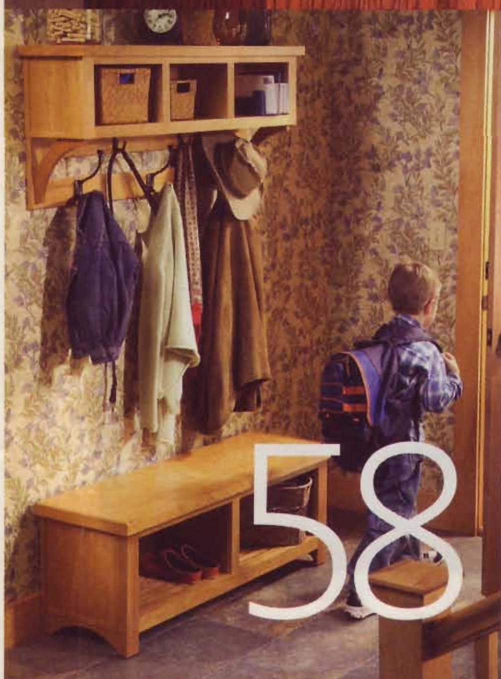
8 Tips for neater painting with masking tapes

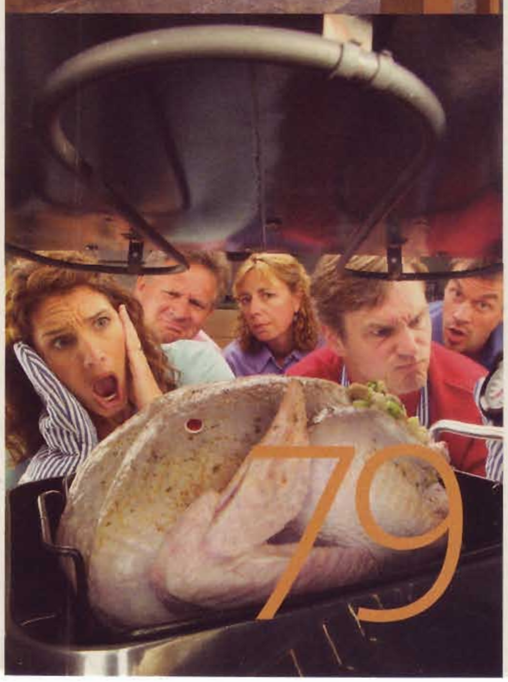
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Features

NOVEMBER 2005 VOLUME 55, NO. 10, 463RD EDITION







Cover photo: Mike Krivit



Departments







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HomeCare&

TIPS, FIXES & GEAR FOR A TROUBLE-FREE HOME

Problem prevention

Plastics damage wood finishes

Have you ever lifted a knickknack off a shelf and noticed footprints left in the shelf's finish? Plastics contain chemicals that keep them soft and flexible. These "plasticizers" can leach out of plastic and into wood finishes. The result is usually a faint, hazy stain in the finish, but you could also find indentations and soft spots in the finish. Just about any type of plastic or synthetic rubber can damage just about any type of wood finish (including polyurethane, lacquer and the high-tech finishes applied by furniture manufacturers). Staining can even develop overnight, although it often takes weeks.

Prevention is simple: Avoid contact between plastics and wood finishes. Stick adhesive-backed felt pads to appliances, knickknacks and anything else that sits on a wood surface. Don't leave vinyl tablecloths or placemats on tables for long periods. Don't leave books lying on furniture (book covers often have plastic coating). Use cloth—not rubber—furniture pads on wood floors.

Repair can be difficult and refinishing is often the only solution. But if you notice a stain

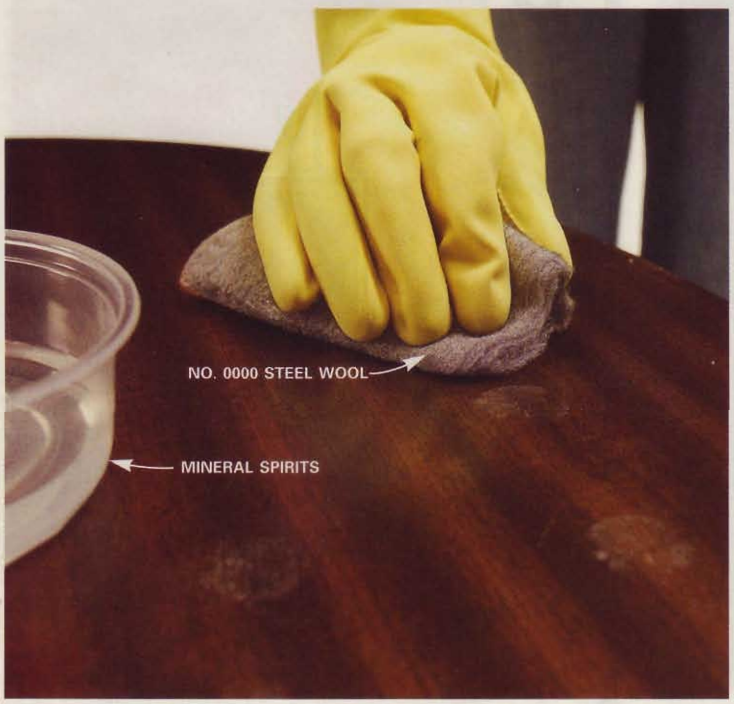


Repair

by Gary Wentz



before the plasticizer penetrates deeply, you may be able to rub it out. Dip No. 0000 steel wool into mineral spirits and rub gently, parallel to the wood grain. The mineral spirits acts as a lubricant while the steel wool slowly removes the finish. Rub for a few seconds, wipe off the mineral spirits and then rub more if necessary. Be careful not to rub completely through the finish. The spot where you rub may become more or less glossy than the surrounding finish. To restore a uniform sheen, apply furniture wax or polish to the entire surface according to the manufacturer's directions. If you think your piece of furniture might be old or valuable (or both), leave repairs to an expert (under "Antiques, Repair & Restore" in the phone book).





Fall maintenance

Blast out soffit vents

Good roof ventilation is crucial for energy efficiency in the summer and ice dam prevention in the winter. Vents on the roof usually need no maintenance, but soffit vents often get plugged by insulation and other debris. All it takes to clear debris from soffit vents is a blast of air. An air compressor provides the most powerful blast. And with a section of 1/2-in. PVC pipe, you don't need a ladder. You can also use a leaf blower or a shop vacuum that allows you to connect the hose to the exhaust port (don't try to clear the vents with suction).

If your vents are painted, look at them closely—a careless paint job can plug the fine screen inside vents. For paint-plugged vents, the best solution is replacement.

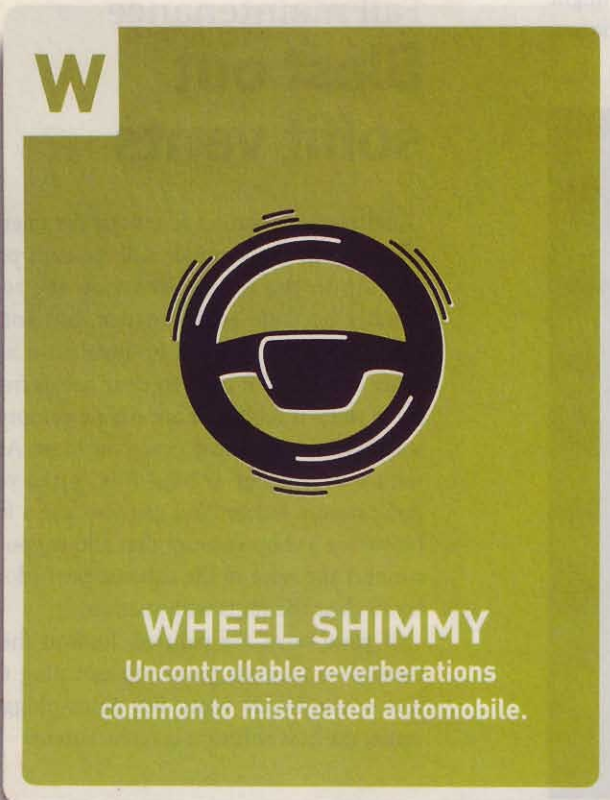


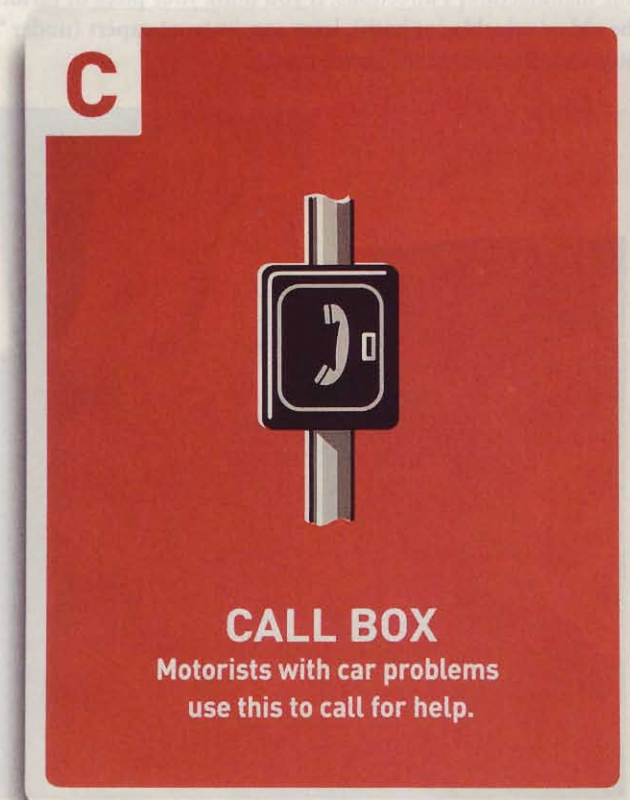


Home security

Keep spare keys in a lock box

Hiding a house key is risky business. Clever (or lucky) burglars sometimes find hidden keys. And insurance companies may refuse to cover your losses if there's no sign of forced entry. The solution is a combination lock box (about $12 at home centers and hardware stores). Screw it to a fence post or your house in an inconspicuous spot. But don't use the short, wimpy screws provided by the manufacturer. A crook could pry off the box, take it home and patiently saw it open. Instead use four No. 10 x 2-in. screws, preferably stainless steel.





Cleaning tip
Grille duster



If the grille on your bathroom exhaust fan is clogged with dust, try a trick that's faster and more effective than vacuuming: Turn on the fan and blast out the dust with "canned air" ($5). The fan will blow the dust outside. This works on the return air grilles of your central heating/cooling system too. Run the system so that the return airflow will carry the dust to the filter. You'll find canned air at home centers and hardware stores, usually in the electrical supplies aisle. **Caution:** The cans contain chemical propellants, not just air. Don't let children play with them.

Installation tip

Toggle bolts for sturdy mounting on fiberglass

Fastening towel bars, shelves or hooks to a fiberglass or plastic shower surround can be tricky. The surround is simply too thin to hold screws and there's often a gap of 1 in. or more between the surround and the wall studs behind it. But with 1/8-in. toggle bolts, you can mount most light-duty hardware (like the adjustable shower head bar shown here). Keep in mind that this leaves big holes (3/8 in.) in the surround that can't be patched later, so anything you mount will have to stay there permanently. The mounting system shown here isn't strong enough to support the full weight of a person, so we don't recommend it for installing safety grab bars.

Photos 1 – 3 show how to use 1/8-in. toggle bolts in a surround. Everything you need is available at home centers and hardware stores. Here are some pointers:

- Some areas of a fiberglass surround may be reinforced with plywood. After you mark the hole locations (**Photo 1**), drill 3/16-in. holes. If you strike plywood behind the fiberglass, you can drive in stainless steel screws instead of using toggle bolts. If you don't hit plywood, drill 3/8-in. holes.
- When you're drilling through the side of the surround where the shower valve is mounted, apply only light pressure as you drill. Otherwise, you might suddenly punch through the surround and puncture pipes.
- When you buy toggle bolts ($2 per pair), also buy brass machine screws ($1) to replace the steel screws that come with the toggles. Steel heads will rust and stain the surround.
- When you tighten the toggle bolts (**Photo 3**), it's OK to use a drill. But do the final tightening by hand. Too much torque can crack the surround.

Art Direction • DAVID FARR and RICK DUPRE
Photography • BILL ZUEHLKE





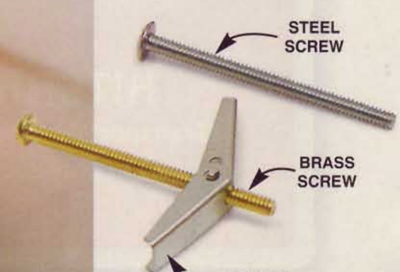
1 Mark the hole positions and drill 3/8-in. holes through the fiberglass. For a clean, chip-free hole, use a brad point bit.



2 Run a light bead of silicone caulk around the holes and insert the toggle bolts.



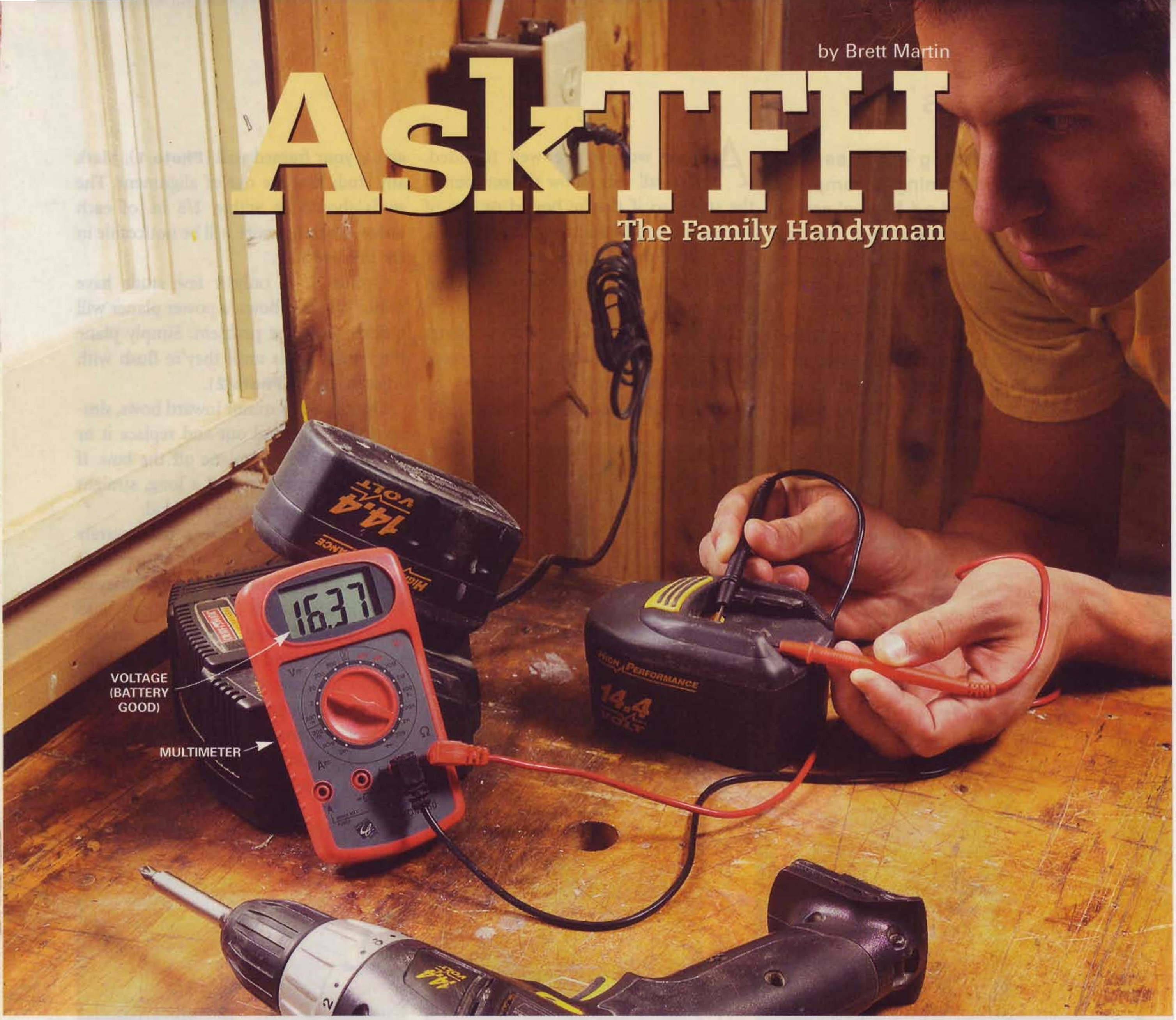
3 Tighten the toggle bolts. Hold the mounting bracket away from the wall as you turn the screws; otherwise the toggle will simply spin inside the wall.



by Brett Martin

AskTFH

The Family Handyman



Rundown cordless drill

Q The battery on my cordless drill runs down quickly. Can you help me solve this problem? The battery is 14.4 volts.

Alva Cahill, via e-mail

A Chances are your battery is worn out or damaged. To test it, first plug it in and charge it for at least an hour. Then set a multimeter to a 24-volt range setting and touch the two battery terminals with the probes as shown. Fully charged, a battery should test 1 to 2 volts higher than the voltage listed on the battery. In your case, the battery should show at least 14.4 volts and maybe even more than 15 volts. If it's below 13 volts, the battery needs to be replaced.

If your battery shows a high voltage but still doesn't hold a charge, take it to a tool repair shop for additional testing. If the battery tests OK, the problem may be in the way you use the drill. If you overburden the motor by using a dull drill bit or pushing too hard when drilling, you'll quickly drain the battery and strain the motor.

The main reason that power tool batteries go bad is they're run down too low before recharging. This can cause a polarity reversal in some cells, which is why they fail to reach their listed voltage when recharged. Unlike cell phone batteries, a power tool battery should be charged as soon as it begins to slow. Let it cool, then put it in the charger at room temperature. A battery may also fail if it sits for several months and the power drains completely.

Sometimes a battery dealer can replace the cells in the battery. But that's usually not worth the cost if you can find replacements. Unfortunately, replacement batteries for inexpensive power tools may be hard to find, and their life span is often relatively short.

Wavy walls

Q I'm finishing my basement and the framing is complete. However, I placed a 4-ft. level across several studs and noticed that my walls aren't as straight as I'd hoped. When a stud is bowed, what is the easiest way to make it straight again without removing it? I'm worried about how the drywall will look after it's fastened to these uneven studs.

Dave English, via e-mail

A Your worries are well founded. Drywall will follow the contour of the studs, so if they're bowed or out of alignment, you'll end up with a wavy wall. And if your drywall contractor has to fix the problem, you can bet that you'll get an extra charge.

You have a couple of options here, depending on how many studs are bowed and how badly they're bowed. Start by placing a long straightedge horizontally across your framed wall (**Photo 1**). Mark any studs that are out of alignment. The studs should be within 1/8 in. of each other. Anything more will be noticeable in the finished wall.

Option 1: If only a few studs have minor outward bows, a power planer will quickly solve the problem. Simply plane the bowed studs until they're flush with adjacent studs (**Photo 2**).

Option 2: For minor inward bows, simply knock the stud out and replace it or turn it around and plane off the bow. If you can't remove it, nail a long, straight 1x2 or 1x3 to the side of the stud.

Option 3: If you have a few severely bowed-out studs that are more than 1/2 in. out of alignment, make a series of 1-3/4-in.-deep kerfs (saw cuts) every 8 to 10 in. in the bowed area with a circular saw. Toenail a 16d nail through each kerf. As you nail, the cuts will close and the board will straighten. To reinforce the cut studs, screw scrap 1-in. lumber alongside the cuts, making sure the scraps don't protrude past the edge of the stud.



1 Lay a long straightedge across the studs to find studs bowed more than 1/8 in.



2 Hold the straightedge vertically along the stud and mark the bow. Shave off the bow with a power plane.

Leakproof flashing corners

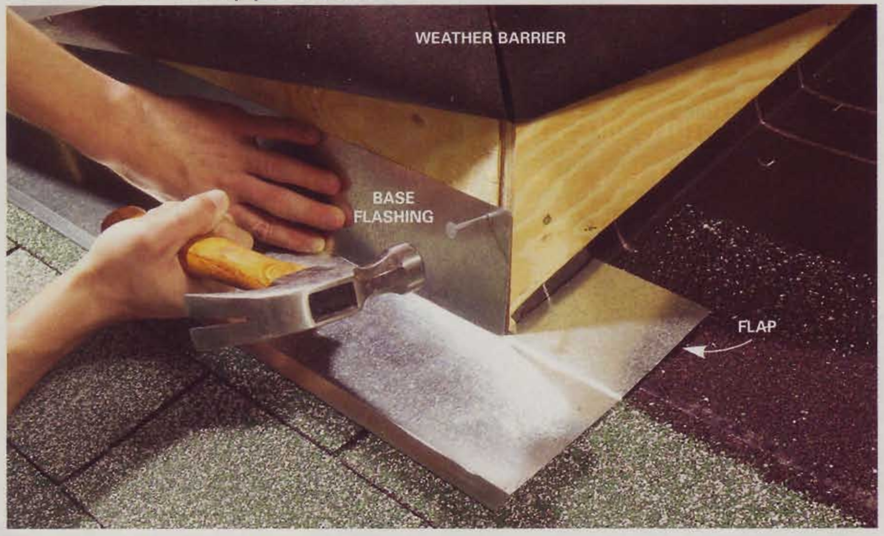
Q I'm redoing the roofing around a dormer and can't figure out how to make a leakproof corner flashing. What's the trick?

William Bockus, Sweet Valley, PA

A There are two good ways to handle corner flashing. The first, bending two pieces and caulking the joint (**Photos 1 - 3**), is the most common because you can do it on the spot with the flashing at hand. If you bend nice crisp corners and nail carefully, you'll only leave a tiny hole to caulk at the corner (**Photo 3**). Remember to place the flashing under the weather barrier on the dormer. If you're flashing a masonry chimney, nail the flashing to the roof as far up the flashing as possible. Cap flashing (counter flashing) inserted into mortar joints will cover the top edge.

The second, forming and soldering a custom piece to fit the corner (shown below), is the best because it doesn't leave any potential leak spots (at the caulked gaps). Unfortunately, you can't solder aluminum flashing, and soldering galvanized steel is difficult. You'll have to measure your roof slope and have a sheet metal or gutter-making shop make one for you. It'll cost $15 to $30. You may have to nail the lower edge to the roof to hold it flat. If so, cover the nail head with a dab of silicone.

Method 1: Wrapped corner



1 Run the base flashing 4 to 5 in. beyond the dormer and cut the top section along the dormer edge. Bend the flap down and nail along the top edge.



2 Notch the first step flashing, leaving a 1-in. flap to bend around the front of the dormer. Nail along its upper edge. Add shingles and additional step flashing.



3 Squeeze a thin bead of caulk over the leftover gap and along the bottom joint.

Method 2: Soldered corner

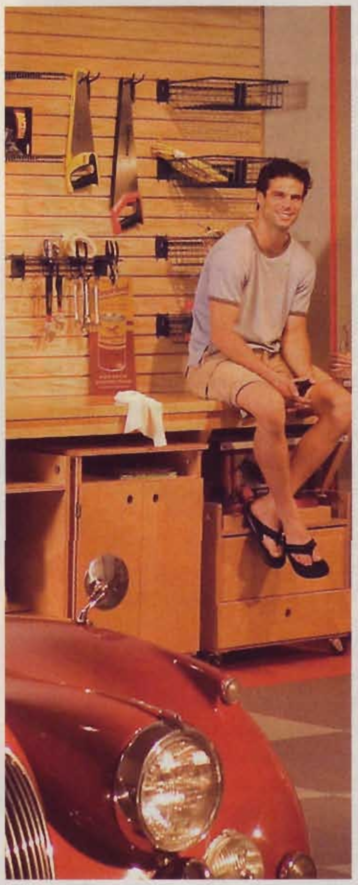
Lay soldered corner flashing around the corner and over the base flashing. Nail the flashing to the dormer near the top edge and continue with the shingles and step flashing.



Help for Katrina victims

The devastation caused by Hurricane Katrina is heartbreaking, and much on our minds here at The Family Handyman. We urge all of our readers to do as we have done, and help the victims of this natural disaster however they can. A financial gift to Hurricane 2005 Relief will help the American Red Cross bring food, shelter and other assistance to people whose homes and lives have been demolished. Many other charitable organizations are also assisting in the relief. Please give.

Popular garage storage wall



Lots of readers have asked us about the nifty wall storage system shown on the cover of our September issue. The system we used is made by StoreWall (866-889-2502, www.storewall.com). We purchased it at www.completegarage.com (866-892-0200). A 15-in.-wide x 8-ft.-long wall panel costs $60. The hooks, shelves and baskets cost $5 to $45 each. Type "garage storage" into a search engine like Google or Yahoo! and you'll find dozens of similar systems and retailers.

For less than half the cost of a store-bought system, you can build your own system from plywood and inexpensive hardware. We showed how to do it in our Dec./Jan. '05 issue. To order a copy of the article or a back issue, see p. 5.

READER MYSTERY PHOTO



Cracks at the ceiling

Q Our 10-year-old single-level home has a full-span truss roof, and in the winter, a crack opens between the ceiling and the walls down the center of the house. It grows up to 1/2 in. wide and has pulled the drywall tape off the ceiling. How can we stop it?

Mike Horn, Iowa

A This problem occurs occasionally with roof trusses. Trusses are designed to carry the weight of the roof on the ends, that is, the outer walls. If a seasonal crack opens along a wall somewhere in the middle, one or both truss ends are rising or the truss is arching. The first case is a foundation problem. If the footings under the wall aren't deep enough, the freeze/thaw cycles in your Iowa winters could lift the outer walls. Changing moisture conditions in expansive, heavy clay soil can also lift the walls, but I don't think that's the problem in your case. You'd probably see other wall/floor gaps or cracks as well.

The second cause, truss arching or truss uplift, is a slight bowing of the entire truss upward during the winter. Moisture that escapes into the attic in cold weather tends to be absorbed by the cold top chords (**Figure A**), which causes them to expand slightly. The bottom chord doesn't expand because it remains buried in the insulation close to the warm ceiling. The result is a slight warp, just as a board warps when one side is damp and the other remains dry. The warp goes away once the weather warms and the moisture content in the wood equalizes.

One solution is to reduce the humidity in your attic by (1) closing up air leaks through the ceiling, and (2) making sure you have good, unobstructed attic ventilation (soffit and roof vents).

Another solution: Don't nail the ceiling drywall to the trusses within about 16 in. of any wall. Instead, support those edges by attaching them to blocks nailed to the tops of the wall framing or to special drywall clips attached to the walls. That frees the trusses to flex slightly upward without pulling the drywall corners apart.

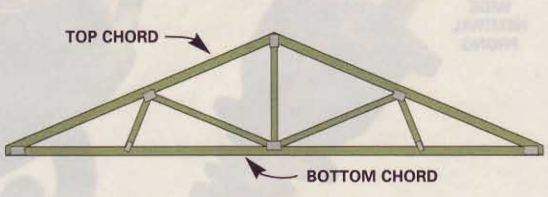


Figure A Typical truss

Wiring savvy

Q In the Sept. '04 issue, p. 17, you stated that the neutral wire must be connected to the silver screw. Why does it matter which side of the light bulb is connected to the neutral? It'll work either way.

Ray M., via e-mail

A It's a safety issue. Normally, power (voltage) comes through the tab on the socket base. The threaded socket is the neutral. So when the switch is off, all "hot" parts of the lamp are well protected. And when the switch is on, only the tab at the bottom of the socket is "hot." But if the wiring is reversed and the power goes to the threaded socket, the threaded socket is *always* hot, whether the switch is on or off. There's a much greater potential for getting a dangerous shock, especially when changing a bulb. The worst situation occasionally occurs in old fixtures when the cardboard insulation sleeve wears out and the outer metal shell of the socket touches the threaded socket. If the threaded socket is hot, every metallic part of the lamp becomes hot! Remember when repairing lamps, the neutral wire in the lamp cord is marked (usually with a rib or ribs) and it connects to the wide blade of the plug at one end and to the neutral screw (usually silver but may have some other identification) at the other end.

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Consultants • AL HILDENBRAND and JOHN WILLIAMSON, MASTER ELECTRICIANS





Add-on switch controls

by Travis Larson

The space-age convenience of remote control is now available in an easy-to-install technology called Z-Wave. This new system will wirelessly switch on or off any combination of lights or outlets from a portable remote or with a control panel by your bedside table, workstation, kitchen countertop or anywhere else in the house. Best of all, you don't have to buy a whole-house computer system or open walls to install or reroute wires.

Here's how it works: Z-Wave consists of two simple elements, a controller that sends a signal and a receiver/switch that receives the signal and turns the power on or off. There are several types of receivers. Some take the place of conventional wall switches, others take the place of wall outlets, and still others simply plug into wall outlets. All will allow you the option to use the outlet or switch manually as before.

Once you mount the receiver/switches, you simply program the controller to operate them. Controllers have several special features. They can operate several switches from a single button. Or use the timer function to preset devices to operate automatically. Say, for example, you come home every night after dark at 8. You can set up your home so that at 7:55, the outside security lights are turned on, and inside the house, the garage, hallway and kitchen are all brightly lit for your arrival.

You can start your system with only a few devices and build from there, without worrying that the technology will be outdated next year. Z-Wave has a bright future. Dozens of companies have signed on to the Z-Wave protocol, so you'll be able to outfit your home with products from different companies as long as you choose products that sport the Z-Wave label. Just look for that label when you buy. (Within months, Z-Wave–compatible products like drapes, blinds, door locks, garage door openers and home security products will be available.)

Art Direction • DAVID SIMPSON
Photography • MIKE KRIVIT

Remote Controls



Master Remote Control (\$130): Controls all components either by the push of a button or with timing functions.

Remote Control (\$50): Controls individual devices and preprogrammed combinations anywhere in the house.

Buyer's Guide

For an on-line demo, go to: www.zen-sys.com/media/57.htm

Z-Wave products are available from the following companies: Intermatic (www.intermatic.com), Homeseer (www.homeseer.com), Smart Home (www.Smarthome.com) and Fry's electronics stores. Or type "Z-Wave" into any search engine and you'll have tens of thousands of hits for equipment sources and general information.

Hi-Tech Solutions

Receivers/switches



Appliance Module
($40): Controls appliances and compact fluorescent bulbs.



Plug-in Lamp Module
($40): Controls lamps.



In-Wall Switch/Dimmer Module ($40): Controls hard-wired lighting either remotely or manually.



Outdoor Lighting Module ($40): Controls patio, landscape and holiday lighting (weather resistant).

Sharpen Your Skills

Masking tape tips

by Jeff Gorton



Paint cleaner, straighter edges and crisper corners

Masking off baseboard and other trim is a great way to get a professional-looking paint job. You'll get a crisp, clean paint line where the walls meet the trim. And the job will go quicker because you'll avoid the time-consuming "cutting in" with the paintbrush and cleaning up paint spatters from your woodwork. Of course, masking itself requires a little patience and skill. Wavy tape will result in a wavy paint line. Poor adhesion will allow "paint creep." And ragged tape in corners will leave blotches. In this article, we'll show you techniques that will solve these problems and make your masking job go quickly and smoothly.

Pull from the roll to get the tape perfectly straight

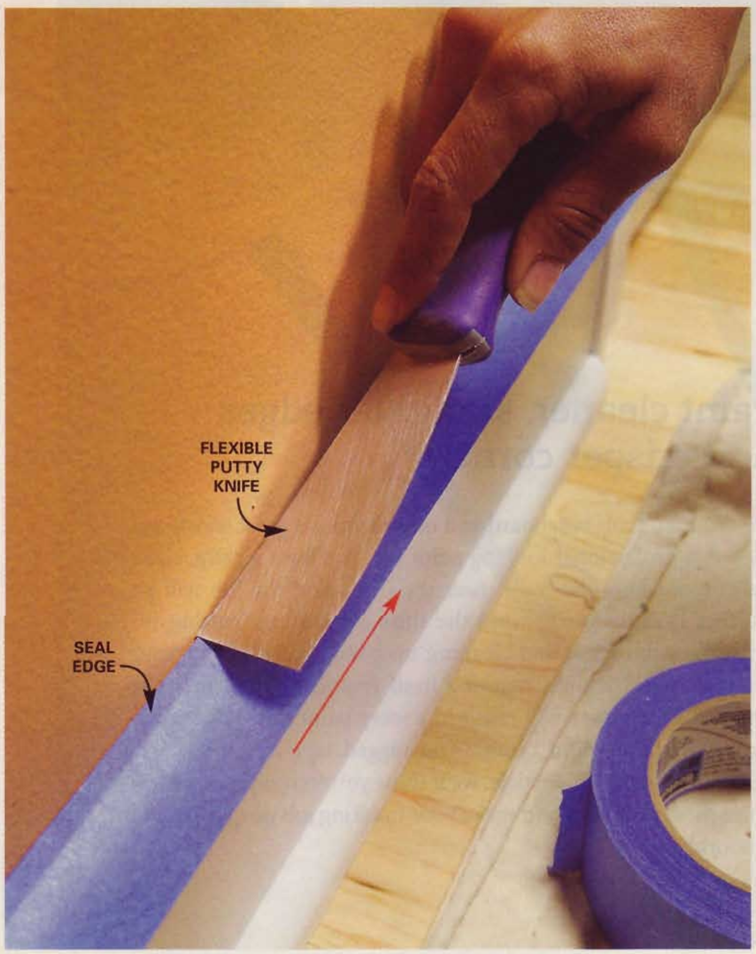
One of the trickiest parts of masking is getting the tape on straight and tight against the wall. There are many techniques, but here's one that works great. Strip 8 to 10 in. of tape from the roll and use the roll itself, held tightly against the wall, to pull the tape straight (**Photos 1 and 2**). It's a little awkward at first, and may seem slow, but the results are nearly perfect every time. Use this technique wherever you're masking at a right angle to another surface.



1 Position the end of the tape precisely and stick it down. Hold it in place while you pull about 8 to 10 in. of tape from the roll.



2 Lay the tape roll flat against the wall and rotate the roll to tighten and straighten it. Slide your finger across the tape to press it down.



Seal the edge to prevent bleeding paint

Seal the tape to the surface by pressing it down firmly with the edge of a flexible putty knife as shown. This is the most important step in good masking and it only takes a few moments. If you skip it, you risk a loose seal that will allow paint to seep underneath. You'll have to scrape off the seeped paint later and touch up the trim.

Keep in mind that you don't have to press down the entire width of the tape. Sealing about 1/32 in. along the edge is all *that's needed. Hold the putty knife at an* angle as shown. This puts pressure along the critical wall edge of the tape.

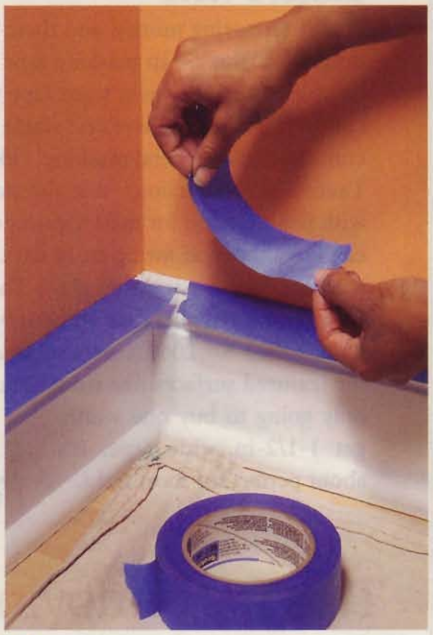


Run the blade of a flexible putty knife along the edge of the tape. Apply firm pressure but avoid wrinkling or tearing the tape.

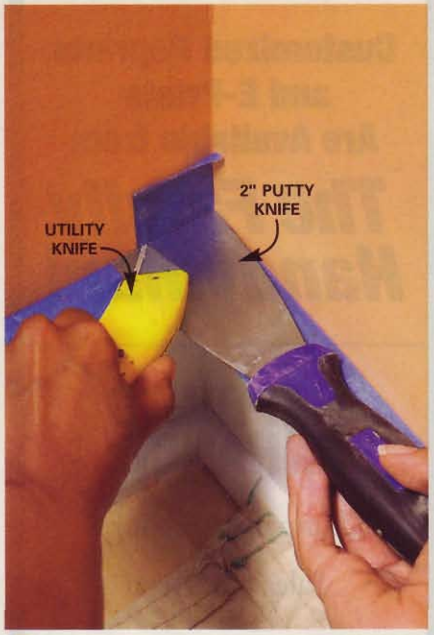
Use extra tape to make perfect inside corners

Getting two long pieces of tape to meet exactly in the corner is difficult, so don't try. First of all, don't worry about getting the long pieces of tape to meet in the corner. Start about 3/4 in. from the corner and run them using the method shown on p. 28. Then go back and finish the corners with small lengths of tape using the technique shown in **Photos 1 and 2**.





1 **Press a short section of tape into the corner with the blade of a flexible 2-in. putty knife.**



2 **Cut the tape using the putty knife as a guide. Peel off the extra tape to create a perfect corner.**

Use flaps to protect trim from roller spatter

Extending the masking tape with a piece of 3-in. masking paper is all that's needed to protect the woodwork from most roller spatter and drips. Three-inch paper is ideal because it'll stand straight out. Wider paper may seem like a better idea, but it'll sag and won't provide as much protection. And since the 3-in. paper doesn't sag, you'll still be able to close doors without the paper getting in the way.

Apply 3-in. paper along the top trim of windows and doors and along the baseboard. Don't bother to fit the paper tight into corners along the baseboard; you don't need much spatter protection there.





Stick 3-in. masking paper to the underside of the tape to shield trim from paint spatters and drips.

Editor's note

I'm all for saving money, and there are times when a cheaper product will do the job. But cheap masking tape is no bargain. If you're going to all the trouble of masking, you want tape that will seal tightly to the surface and come off easily. But there's no single type of tape that will work in every circumstance. For general masking, I like the Scotch-Blue No. 2090. There are two versions: one for standard masking, and one with less adhesion for masking over delicate surfaces. You can leave these on for up to 14 days. You can also use the blue tape on window glass. The adhesive will withstand ultraviolet light without baking onto the glass. Scotch No. 2060 is extra sticky and works well for textured surfaces like stucco and brick. If you're only going to buy one width, get 1-1/2-in.-wide tape. It's about perfect for most tasks.



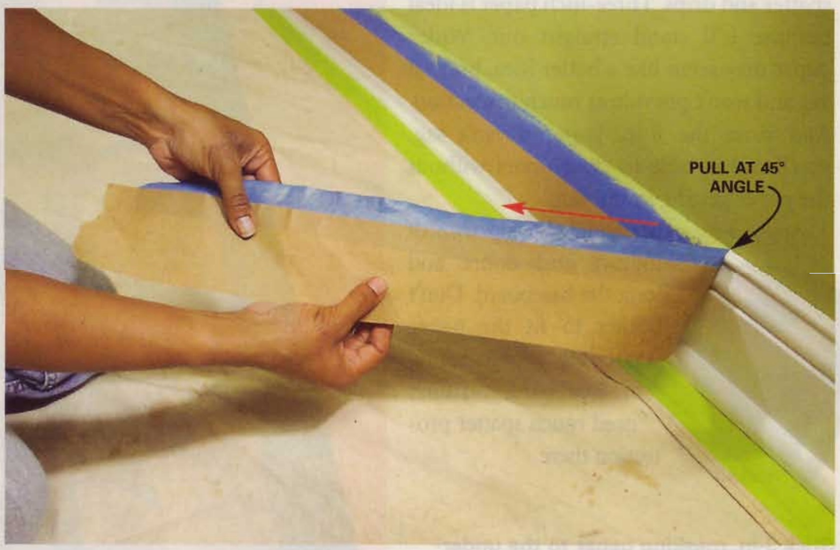
Tips for removing masking tape

Several things can go wrong when it comes time to remove masking tape. If you wait too long, the adhesive on the tape will harden and remain stuck to the woodwork. Or if the paint sets but isn't completely dry, some of the wall paint may peel off along with the tape. Here are solutions to these problems.

If you're a procrastinator or slow painter, choose tape that's designed to be left on for several days. Scotch No. 2090 is one brand that uses a slow-hardening adhesive so it can be safely left on for about 14 days.

To avoid peeling paint, pull the tape off immediately or wait at least overnight for the paint to dry completely. Beware of paint that feels dry to the touch but hasn't hardened and fully bonded to the wall. It may come off along with the masking tape.

Remove tape at about a 45-degree angle to the painted surface as shown to minimize the tendency for paint to peel. And if despite waiting overnight and using a good technique, you notice the paint still peels with the tape, use the edge of your putty knife or a utility knife to cut the seal between the wall and tape before you remove the tape.



Pull tape diagonally rather than straight up.

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Workshop Tips™

by Bruce Wiebe

Adjustable bins

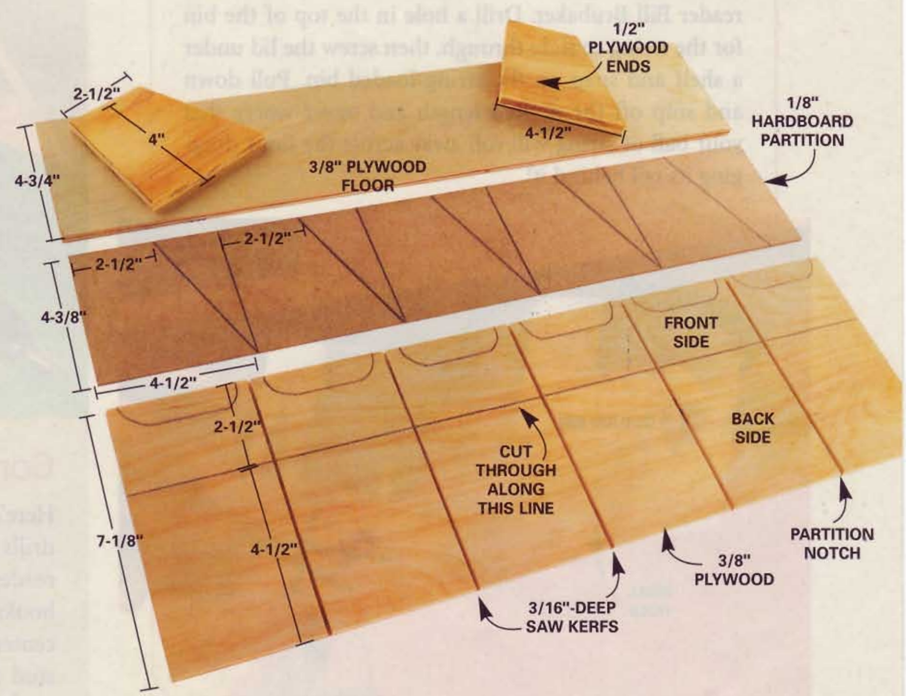


Nail down the hardware organization in your shop. Build these bin racks with removable partitions to suit the size of the hardware you're storing. For one rack, you'll need:

- One 3/8-in. x 24-in. x 7-1/8-in. plywood piece for the sides
- One 3/8-in. x 24-in. x 4-3/4-in. plywood piece for the floor
- Two 1/2-in. x 4-1/2-in. x 4-in. plywood pieces for the ends
- Five 1/8-in. x 4-1/2-in. x 4-3/8-in. hardboard partitions

On a table saw, cut 3/16-in.-deep slots every 4 in. across the 24-in. x 7-1/8-in. piece of plywood. Make the slots just wide enough for the 1/8-in.-thick partition to slide in smoothly. Now saw the slotted piece into strips 4-1/2 in. and 2-1/2 in. wide. Use 1-in. brads and glue (predrilling for the brads) to assemble the sides and angled ends, then nail and glue on the floor. Drop the angled partitions into the slots, mount the rack to a wall, and go nuts sorting and organizing your scattered hardware.

We are grateful to Dean Piersol for thinking inside the box to devise this orderly tip.



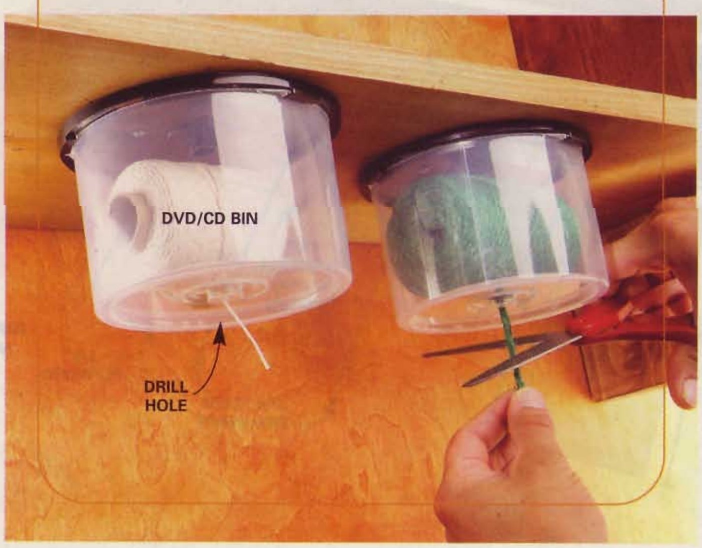


Ambient air cleaning on the cheap

Can't afford an air cleaner for those dusty woodworking jobs on the weekend? Sure you can! Take a new spin on a classic tip, courtesy of reader Kevin Miller. Attach a furnace filter with hook-and-loop tabs to the air intake side of a box fan ($10 at a home center) and hang the fan between the ceiling joists so you won't bop your head on it while you work. Just switch it on and fine dust particles from sanding and sawing will be drawn into the filter by the vacuum created by the fan.

String-dispensing CD bins

Here's a great way to reuse empty CD bins, courtesy of reader Bill Brubaker. Drill a hole in the top of the bin for the string to slide through, then screw the lid under a shelf and snap on the string-loaded bin. Pull down and snip off the desired length and never worry that your ball of string will roll away across the floor dragging its tail behind it!





Cordless drill hangout

Here's a high and mighty way to prevent cordless drills from toppling off your workbench, courtesy of reader James Eubanks. Screw large vinyl-covered hooks (available for $1 at hardware stores and home centers) to a convenient spot on a wall or exposed stud and hang up those drills for safekeeping and easy access.

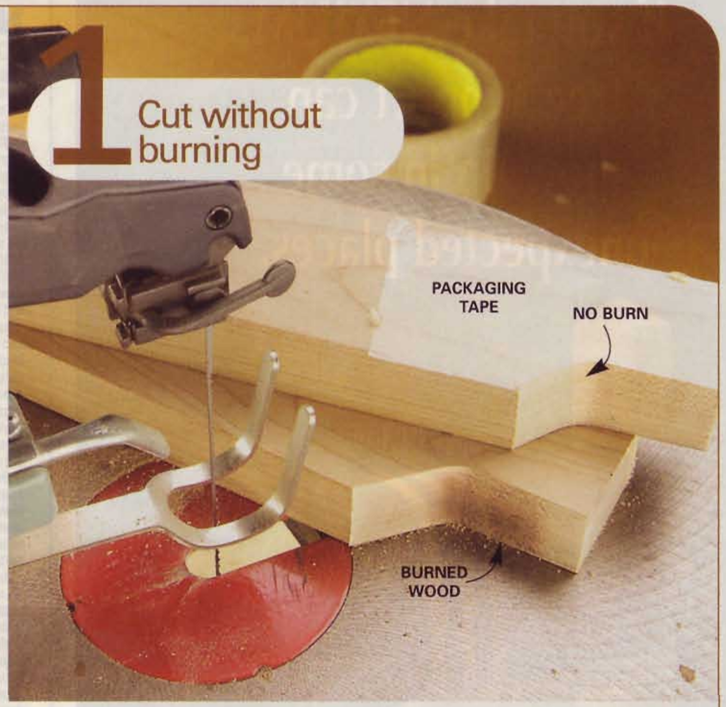
Scroll saw tips

Check out this trio of ideas to improve your scroll saw's performance. You'll have to try this first tip on your saw to believe it! When you're sawing thicker hardwood like maple and cherry, press packaging tape over the workpiece before you apply the pattern (**Photo 1**). The tape lubricates the blade, so it won't burn the wood. Thanks to the tape, you'll also saw thick workpieces with a lot less vibration—the blade will last longer and your hands will too. Thanks to reader Marvin Moebius for this cooling tip.

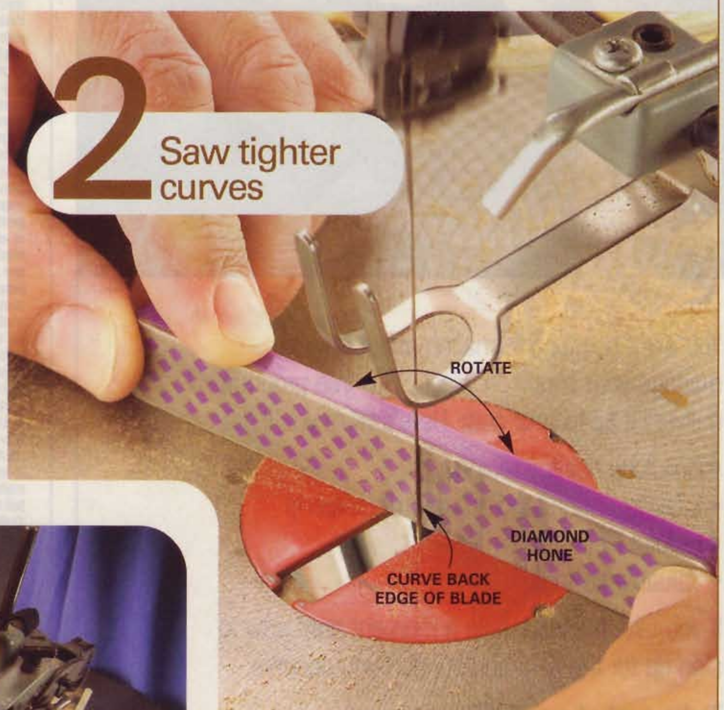
Saw tight corners with less binding by lightly rounding over the back edges of the blade (**Photo 2**). With the saw running, rotate a sharpening stone on the back of the blade to break the sharp corners or wire edges created during blade manufacture.

Keep extra saw blades handy in a piece of 1/2-in. PVC pipe with caps on both ends (**Photo 3**). Mount it on a convenient spot on the saw with a hook-and-loop strip, and change blades with the pop of a cap.

Thanks to reader Bruce Tolle for seeing a way to better sawing in tips 2 and 3.



1 Cut without burning



2 Saw tighter curves



3 Store blades on-board

If you have a shop tip you'd like to share, send it to tfhtips@readersdigest.com or Workshop Tips, The Family Handyman, 2915 Commers Drive, Suite 700, Eagan, MN 55121. We now pay $200 for tips we print. Original contributions become our property upon acceptance and payment. We're sorry, but tips can't be returned.

Editor • DAVID RADTKE
Art Direction • LISA PAHL KNECHT
Photography • MIKE KRIVIT

Wains

Add elegance to your favorite room with easy-to-build wood panels





If your dining room or home office reminds you too much of a workplace break room, it could be time to transform it with this simple woodworking project.

At first glance, this panel design may look too complex for your average do-it-yourselfer, but it's not. The panels are made from three horizontal 1x6 bands that run around the room, with narrower vertical boards spaced every 30 in. or so. The panels are the wall itself. Once you nail on filler pieces and trim, the project takes on a traditional wainscot panel look.

In this article, we'll show you how to plan your layout and cut, fit and finish the wood for any room in your house. We'll also show you how to make clean, tight joints using a plate joiner (Photos 5 and 6). If you haven't used this tool before, don't be intimidated. Although this tool can perform complex joinery, its only purpose here is to cut slots in two adjoining pieces to accept a glued "biscuit" that will then bond the pieces permanently. A plate joiner (also called a biscuit joiner) is a worthwhile investment ($60 to $150). You'll marvel at how simple it is to set up and operate.

by David Radtke

coting made simple

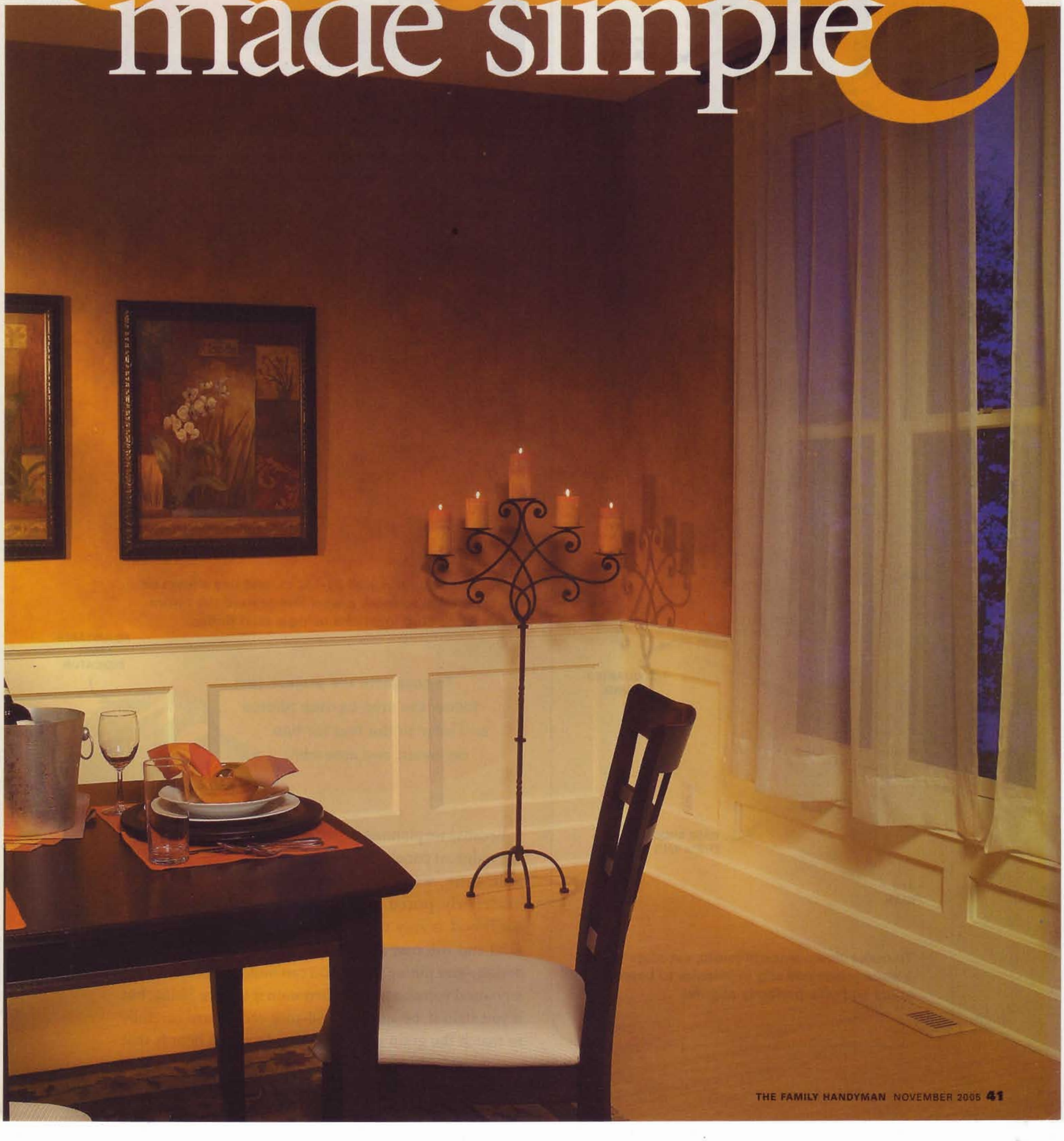
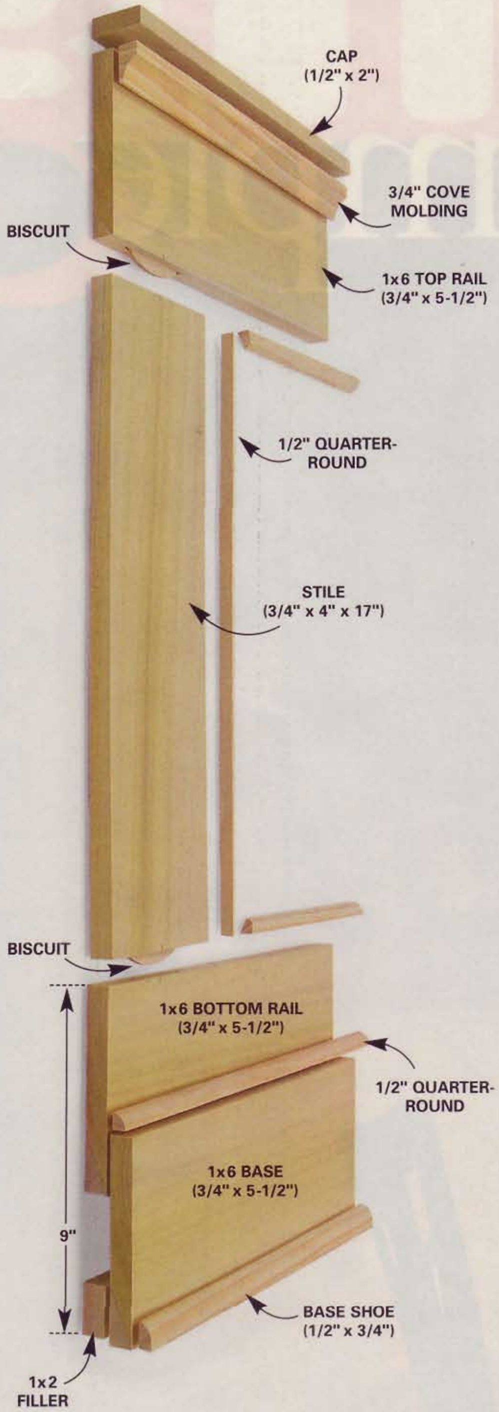


Figure A
Wainscot details



To make clean, smooth joints, cut slots with a plate joiner and slip in biscuits to keep the stiles and rails perfectly aligned.

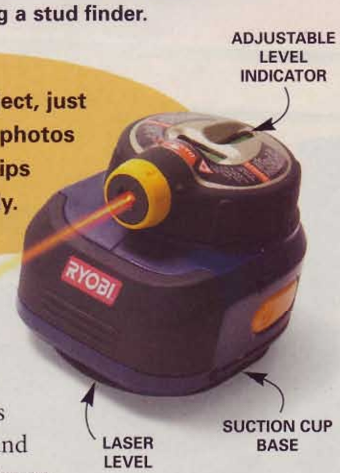


1 Pry off the baseboard in the room and make any necessary wall repairs. Paint the walls.

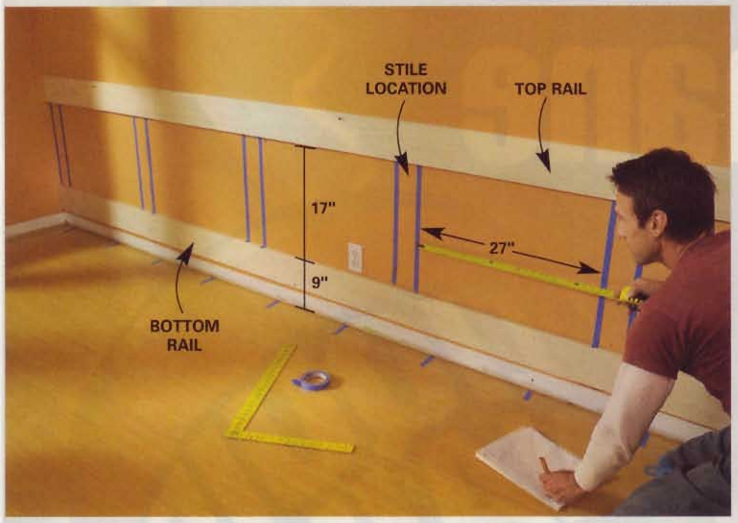


2 Measure up the wall 31-1/2 in. and use a level or laser level to mark a level line around the entire room. Mark stud locations using a stud finder.

To complete the project, just follow the step-by-step photos and refer to the text for tips on layout and assembly.



Because we planned to paint the wainscot panels rather than stain them, we decided to use moderately priced poplar. This hardwood is easy to cut, nail and sand and will cost about $450 for an average-size dining room. You can build the project from any wood you choose and then stain it to your liking, but if you stain it, be sure to hand-pick each board carefully to match the grain and tone. Also, buy long boards that



3 **Tack the 1x6 top rail even with the 31-1/2-in. mark. Nail the bottom 1x6 rail parallel at 9 in. above the floor. Then mark the best positions for the vertical stiles.**



4 **Rip the stiles to width, then cut them to length. Position them according to your layout and mark their centers on the rails.**



5 **Adjust the plate joiner to cut slots in the center of the 3/4-in. boards. Then cut a biscuit slot in the center of each stile at the top and bottom.**



6 **Cut a biscuit slot into the top and bottom rails at each stile center location. Then pull the temporary nails and remove the top rail.**

will run full length from wall to wall to avoid unsightly butt joints that could shift over time and develop a crack.

Planning your layout

First, remove the baseboard and patch any holes. If you plan to repaint the room, do it now, at least above the wainscot area. You'll be able to easily touch it up after completing the project. You'll also have to adapt your window and door molding now to accommodate the 1-1/2-in.-thick profile that your walls will take on as you build the panels (**Figure A**). We changed out all the window and door molding in the room. We used 3/4-in. x 4-in. boards and then nailed a Princeton stop molding on edge (**Photos 10 and 11**) to the entire perimeter to build the trim out 1-1/2 in. from the wall.

It's possible to complete this project in sections in your shop or garage and carry them in as you go, but we had some tricky hallways and corners that made it difficult to get longer sections into the room. We found it much easier to cut and assemble right in the room.

Plan the wainscot height at about 32 in. Then divide the wall into equal sections so that the panel inside the rails and stiles has a height/width ratio of about 1 to 1.6 (vertical to horizontal). This will create panels with good proportions. Lay it out with masking tape and move the tape until you're satisfied. You can vary the positions of the stiles (the vertical pieces) a couple of inches either way. However, as the panels approach a square shape or get too long (closer to a 1-to-2 ratio), you'll find that they begin to look awkward.

Here are some tips for planning the panel layouts around doors and windows:

- Start with the longest wall without doors or windows and establish your panel sizes as described in **Photo 3.**



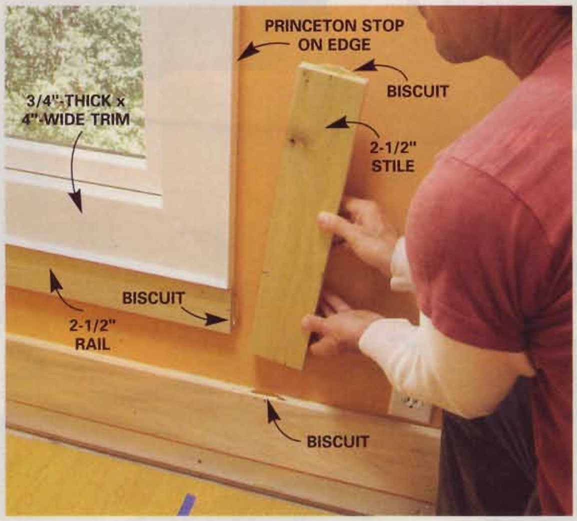
7 Glue the biscuits into the lower rails. Then add glue to the top of the biscuits and set the stiles into place. Push tight.



8 Glue the biscuits to the tops of the stiles and gently fit the top rail onto each glued biscuit. Work fast before the glue begins to set.



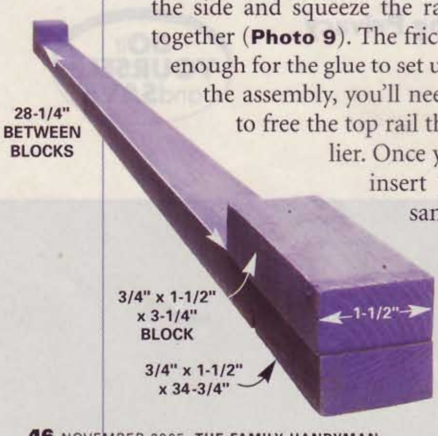
9 Drive homemade friction clamps at an angle to tighten the joints. Nail the top rail into the wall studs as you go.



10 Fit 2-1/2-in. rails under the windows, biscuit the ends and then nail them into place. Fit the stiles to the window trim, then cut the biscuit slots.

Make simple clamps

We made our own clamps from 1x2 pine boards with blocks glued and nailed to the ends. The clamps are made to knock quickly to the side and squeeze the rail and stile pieces together (**Photo 9**). The friction will hold long enough for the glue to set up. When gluing up the assembly, you'll need to pull the nails to free the top rail that you tacked earlier. Once you glue the joints, insert the nails into the same holes in the top rail so they're ready to drive as you knock the clamps tight (**Photo 9**).



- Try to have equal-size panels along the wall. It takes a bit of head scratching, but with a little masking tape, you can keep changing the sizes until they work.
- Take into account electrical outlets. Don't let them fall in the middle of stiles.
- Keep in mind that you can leave smaller panels in the corners, as long as they're of equal size on each end (**Photo 11**). When it comes to doors and windows, you don't have much choice but to reduce the panel size as we did in **Photos 10 – 12**. To compensate for the smaller panel size under and beside window trim, reduce the width of rails and stiles to 2-1/2 in. to avoid chunky-looking spots. Divide the panel under the windows with a stile in the middle (**Photo 14**). The proportion rules tend to go out the "window" here, but the overall effect of wrapping around the window is a custom built-in look.



11 **Cut biscuit slots into the top rail and fit the rail onto the stiles, butting it tightly to the corner and window trim. Clamp and nail it.**



12 **Preassemble small rail and stile sections in tight areas and nail or glue them into place as a unit. Prefit and trim corner boards for a perfect fit.**



13 **Scrape off glue "squeeze-out" as soon as possible. Then sand every joint with 100-grit sandpaper once the glue is dry.**



14 **Nail the 1x2 filler strips to the wall near the floor. Then nail the 1x6 baseboard to the filler and the lower rail.**

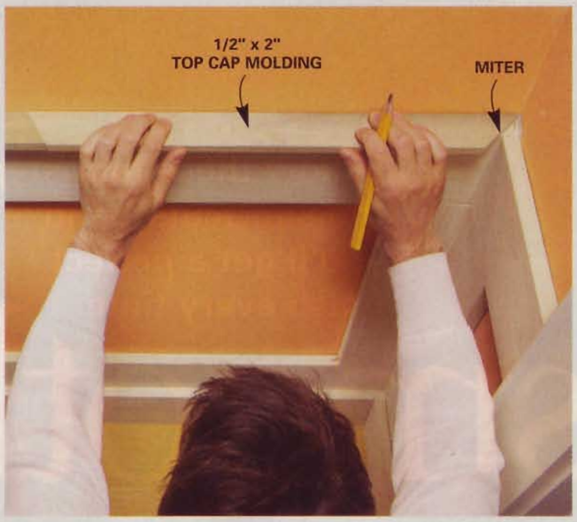
Using the biscuit joiner

We used No. 20 biscuits for joining the rails and stiles. Set your biscuit joiner fence so it cuts exactly in the middle of the 3/4-in.-thick boards. Take a few practice plunges to get familiar with the tool. You'll notice that when you cut biscuits near the corners where the side wall prohibits the tool from cutting the middle of the board, the slot will be off center, causing the biscuit to protrude. If this happens (**Photo 17**), just let the glue dry and chisel the exposed biscuit away. The 1/2-in. quarter-round molding will cover the blemish.

The homemade clamps (p. 46) do a good job of tightening the joints, but it's important to work fast before the glue sets. Have all the slots cut and enough biscuits on hand. Have a helper spread glue while you insert the biscuits. You should clamp within about five minutes.

Special situations

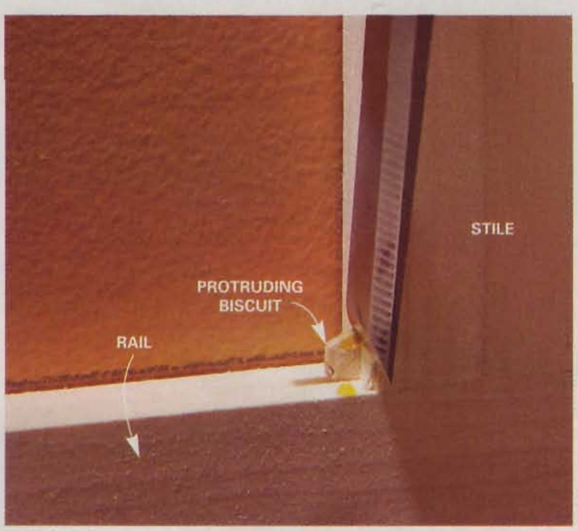
There are no exact rules for working around doors and windows except to plan ahead. Before you nail each piece to the wall, consider where the biscuits need to go. It may be impossible to add a biscuit once the piece is fastened to the wall, so cut the slot *before* you install it. If there are no studs to nail into, apply a bead of construction adhesive to the backside of the assembly and then toenail it to the drywall with your finish nailer (1-1/2-in.-long nails only). The nails will hold the pieces until the glue sets. You'll also notice in **Photo 16** that the cap molding protrudes a bit and needs to be rounded where it meets the window or door trim. Use a quarter from your pocket to outline the radius on the end of the molding, and use a belt sander or wood rasp to shape it before nailing it into place.



15 Fit the top cap molding and nail it to the top rails. Round the corner (Photo 16) to fit it against the window and door casing.



16 Nail the cove molding tightly under the cap molding. This will hide the nails that hold the top rail.



17 Cut any exposed biscuit ends near the edges of narrower stiles with a sharp chisel to make way for the quarter-round trim.



18 Miter the ends of the 1/2-in. quarter-round molding and nail it into place. Add the remaining trim, fill the nail holes and touch up the paint.

Finishing

Whether you paint your wainscot or varnish it, you'll need to sand it. Be sure to sand the rail and stile joints before adding the base and moldings. A random orbital sander works best and cuts fast. If you plan to paint the project, you only need to sand with 100-grit sandpaper, but if you plan to varnish it, give it another sanding with 150-grit. Once you install the moldings, be sure to ease any sharp edges with a final sanding. Refer to the stain and varnish article on p. 50 for additional finishing information.

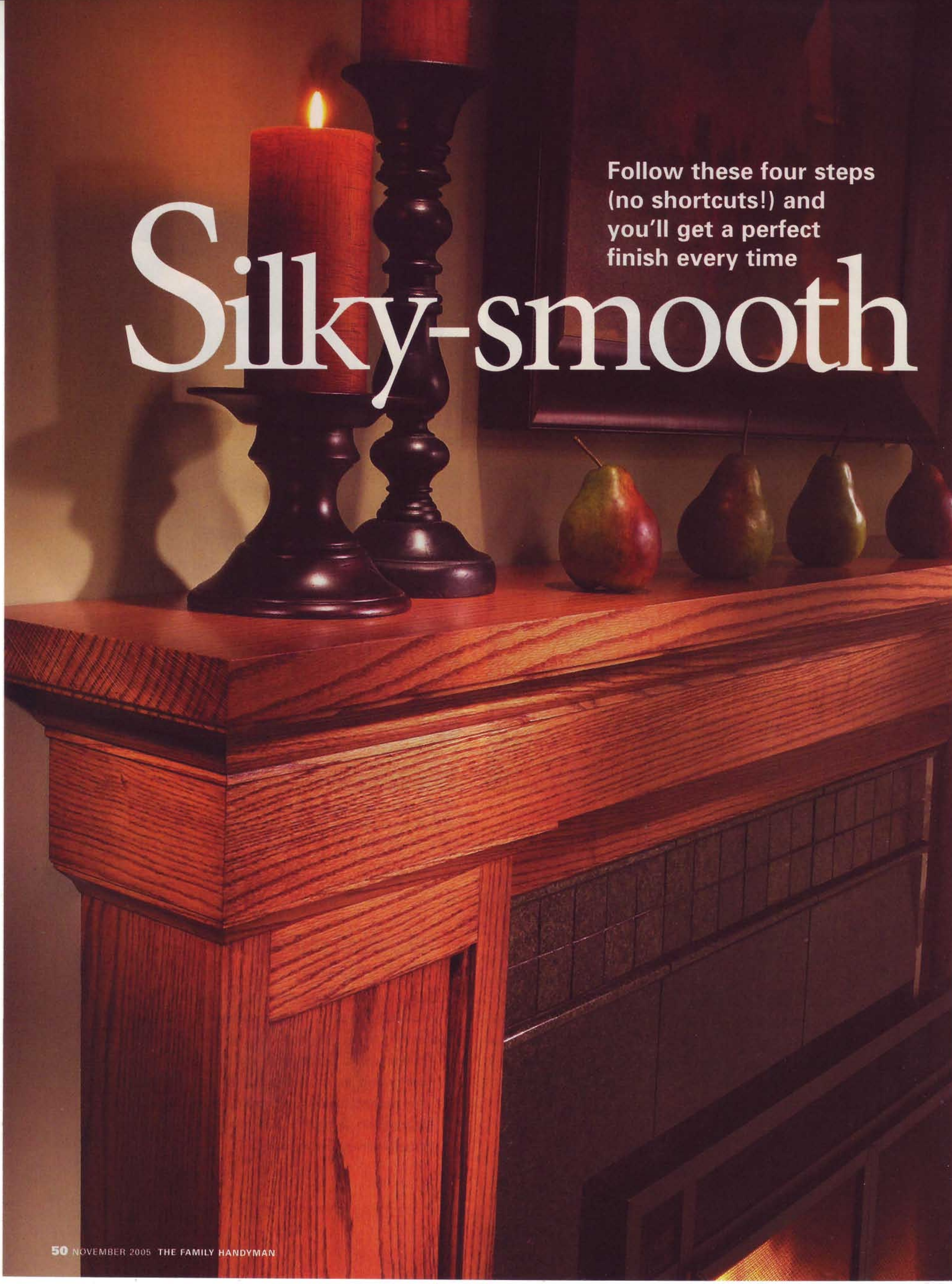
Art Direction • BECKY PFLUGER
Photography • BILL ZUEHLKE
Project Design • DAVID RADTKE

Editor's Note

Electrical outlets can give you fits

We designed the lower rail of the wainscot so that it just fits under electrical receptacle cover plates. Measure the height of your cover plates before you start because you may need to lower the rail to accommodate the receptacles. Also consider shifting your layout left or right if one of the receptacles falls halfway onto a stile.

DAVID



Silky-smooth

Follow these four steps (no shortcuts!) and you'll get a perfect finish every time

finishes on trim

by Travis Larson

No matter how skillfully you install your trim work, it won't look good unless it has a fine finish. Uneven color, dust-flecked surfaces and brush marks all distract the eye and ruin the natural beauty of the wood. Yet achieving a smooth, flawless finish doesn't require expensive tools or special knowledge or skills.

In this article, we'll show you a simple three-day process that'll give you great results every time. We'll show you how and when to sand, using the correct sanding products. (It's not the tedious, mind-numbing job you might think it is!) Then we'll tell you how to apply stain evenly and without blotches on all the surfaces. Finally, we'll show you the best ways to get a smooth satiny surface with a sanding sealer and varnish.

We'll limit our staining techniques to methods that work well on coarse-grained woods, such as oak, ash and walnut. Achieving an even, blotch-free finish on fine-grained woods like cherry, maple, birch, pine and fir is much more difficult and requires extra steps we won't cover here.

Wood finishing isn't complicated, but it does require patience and attention to detail. It pays to get each step right the first time. Going back to correct mistakes is time consuming, and it's nearly impossible to achieve blemish-free results.

Choosing stain and finish

We recommend finishing your wood with oil-based stain (see "Test the Stains," p. 54) and varnish (alkyd) with a compatible sanding sealer beneath it. These finish types are the easiest to apply. Don't confuse alkyd varnishes with polyurethane ones. Polyurethane finishes are tough and have their place, especially on high-wear, water-prone surfaces like tabletops and hardwood floors. But they're less forgiving to use. Alkyd varnish, on the other hand, is easier to sand, which is an advantage if you have runs or drips or would like to apply a second topcoat.

You'll likely have two sheen choices—gloss (shiny) and satin (flat)—but don't be afraid to mix equal quantities of gloss and satin if semigloss is the look you're after. Few home centers carry alkyd varnishes, so you're better off shopping at a paint or woodworking supply store. Read the labels carefully: You'll find that just about every can on the shelf will be a urethane-type finish.

A sanding sealer is the perfect foundation for the varnish topcoat. It's formulated with more solids than conventional clear coats, making it very easy to sand. And varnish adheres better to a well-sanded, sealed surface. Pick a sealer that's designed for the overlying varnish, preferably of the same brand. If you use a sanding sealer that's incompatible with the varnish, the surface may crinkle or even flake off.

Step 1: Sand



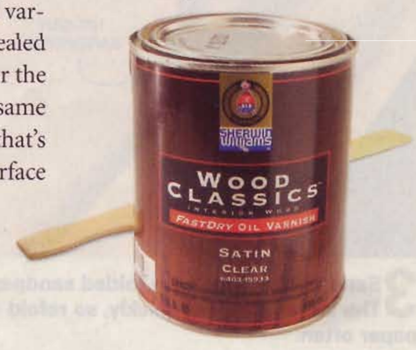
Step 2: Stain

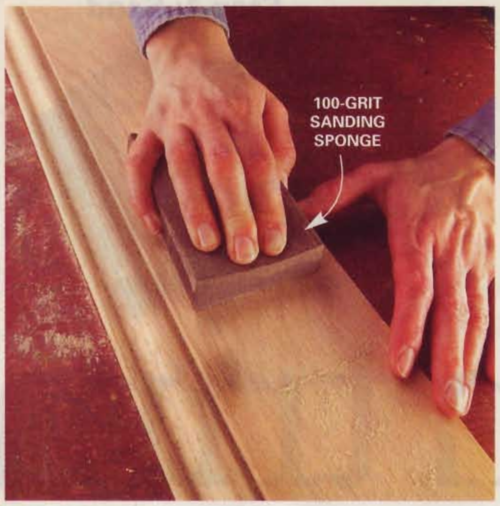


Step 3: Seal

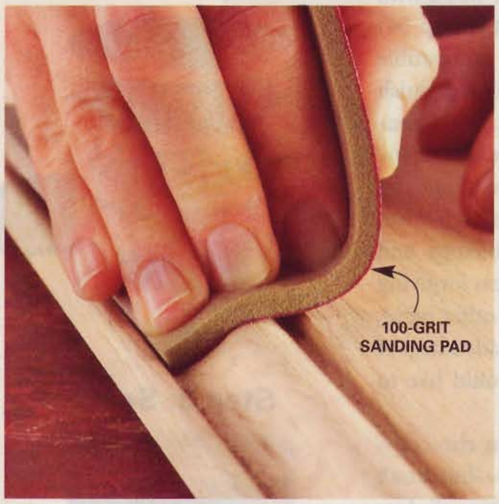


Step 4: Varnish

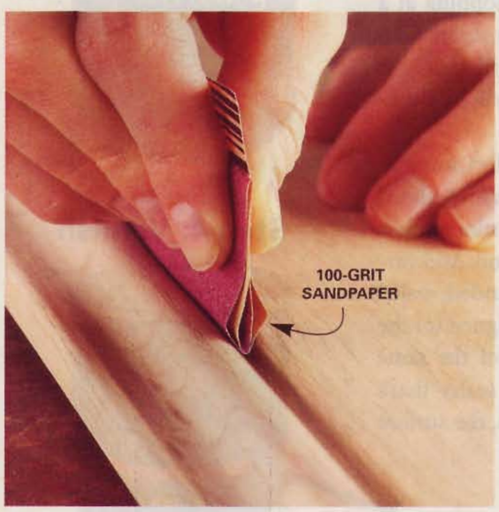




1 Sand flat surfaces with a 100-grit sanding sponge, in the direction of the grain, until you eliminate imperfections and rough areas.



2 Sand curves with a 100-grit pad. You can easily mold it to the contours of the various trim profiles.



3 Sand tight cracks with folded sandpaper. The edge will wear quickly, so refold the paper often.

Begin by sanding

A good finish starts with sanding the bare wood with a 100-grit sanding sponge and/or paper. This step is crucial for achieving a uniform wood surface that'll absorb stain evenly. It also smooths out surface imperfections, which might show through the clear coat. Your goals are to eliminate the sawmill "burnish" (shiny surface left by the planer), smooth off any standing rough wood fibers and sand out any blemishes. Blemishes can include dirt, fingerprints, machining imperfections and label residue. Don't sand with finer grits at this stage or you're likely to end up with uneven stain.

The sanding tool you select depends on the profile and size of the trim you're finishing. For large areas or deep imperfections like chatter marks (washboard textures) from the mill planers, use a random orbital sander. It's aggressive and cuts and smooths quickly.

For hand-sanding, use a sanding sponge for flat areas (**Photo 1**), a sanding pad for curves (**Photo 2**) and a folded piece of sandpaper for tight crevices (**Photo 3**). Always sand in the direction of the grain and sand every square inch whether you think it needs it or not. Your fingertips and eye will tell you when enough is enough. But look closely with good light before you call the job finished. Otherwise, imperfections like scratches caused by cross-grain sanding or chatter marks will become painfully obvious when you start staining. Another common problem is burn marks. Sometimes extra elbow grease will be needed to eliminate those. This may sound like a lot of work, but believe me, if you use fresh paper and sponges, the sanding goes fast.

Must-have finishing supplies

High-quality finishing supplies take the pain out of staining. A $50 investment in these tools and accessories will greatly speed up the job and increase the quality of your finishing work.



- **Sanding supplies. Buy 100-grit (medium) products for sanding the raw wood and either 240- or 280-grit (extra-fine) sanding paper, sponges and pads for sanding between clear coats, depending on the profiles you're sanding.**
- **Brushes. Buy two 2-1/2-in. china-bristle brushes (natural bristles). Use them for staining, dry brushing (Photo 6) and applying the clear finishes. Don't spend less than $8 for a brush. (Pros will spend more than $20.) If you take care of it and clean it well, a top-quality brush will last for 20 years or more. A cheap brush is more likely to leave brush marks and bristles in the finish.**
- **100-percent cotton painter's rags. Buy a box at a home center for about $12. Don't use old bed sheets or clothes that contain synthetic fibers. They may leave behind dyes and won't absorb stain nearly as well.**
- **Gloves. A box of disposable gloves will protect your hands from solvents, and you won't have to struggle with putting on reusable ones after coffee breaks.**
- **Mineral spirits. Buy a 1-gallon can to clean brushes and to thin stain if needed.**
- **Tack cloths. Find tack cloths in the paint department. Use them to eliminate the last specks of dust after you sand between coats.**



4 **Saturate the wood with stain by brushing a liberal coat quickly over the entire surface.**



5 **Wipe off the stain gently and evenly with clean cotton rags in the same order that the stain was applied. Watch for streaks.**



6 **Clean stain from cracks and crevices with a dry brush. Wipe the brush on a clean rag or brush it on newspaper to clean off the stain between strokes. Let the stain dry overnight.**

Clean the room

A clean work area is crucial for a smooth, blemish-free finish. If you have the option, sand the wood outdoors or in a room that's separate from the finishing area.

If you're forced to sand in the finishing area, wait several hours after sanding before cleaning the room, to give the dust a chance to settle out of the air. Vacuum the floor and any nearby work surfaces. Then damp-mop those surfaces too. Avoid sweeping—it just stirs up more dust. If there are rooms overhead, declare a moratorium on overhead foot traffic during finishing. Otherwise dust on the underside of the floor will rain down on wet finishes. Or do your clear-coat work after everyone's gone to bed. If you're working in a room that's heated or cooled with forced air, warm or cool the area a few hours ahead and then shut off the system until clear finishes are applied and become dry to the touch. That'll keep ventilation fans from stirring up more dust or bringing it in from other rooms.

CAUTION

Spread out stain-soaked rags and let them dry before disposing of them in a waste container. Piles of damp staining rags are a spontaneous combustion hazard.

Brush on the stain and wipe it off fast

The key to getting an evenly stained surface is to saturate the wood thoroughly and then wipe the stain off evenly. Start by stirring the stain. Scrape the stir stick across the bottom and pull up any settled solids, then work them into the solvent until they're all dissolved. (Use the

Test the stains



Oil stains are the finish of choice among pros because they're forgiving and easy to apply. Avoid "fast-drying" stains. You're better off with ones that require at least overnight drying time. Getting the best color usually requires stain mixing, so buy a few different 4-oz. cans in the color family you're interested in.

Then sand extra trim, cut it into 3-in. pieces and start experimenting. Mark all the pieces with the colors you use to keep them straight. You can lighten stain easily by diluting it with paint thinner. It's not unusual to use mixes that are 25 percent or even 50 percent paint thinner. But measure carefully so you can replicate your results on a larger scale. Next, finish the samples with the same sealer and varnish coats you plan to use, to get an accurate finished look.

Trying to match a stain that's on existing trim is difficult, especially if the trim is more than a few years old. Even pros rarely attempt it themselves. The best bet is to bring a sample of the finish you want to match, along with raw wood samples, to a paint store that offers a color-matching service. You may have to shop around a bit. As a last resort, find a furniture refinisher that's willing to help.



7 **Brush sanding sealer evenly onto the entire length of each board. Take care not to miss any spots.**



8 **"Tip-off" the surface immediately using long strokes from end to end. Let the sealer dry overnight.**



9 **Lightly sand the sealer with an extra-fine pad until the finish is smooth to the touch and a uniform flat, frosted color.**

same method to mix the sanding sealer and the varnish later.) The best application method is to simply dip a natural-bristle brush into the stain and brush it right onto the wood (**Photo 4**). Rags are messy and waste stain. Don't skimp when you're applying stain—more is better.

Wipe off the stain with clean cotton rags in the same order you put it on. The idea is to let it soak into all areas of the wood for about the same amount of time (**Photo 5**). Wipe with light, even pressure. You'll know if you wipe too lightly because you'll leave streaks. Refold wiping rags frequently so you have dry cloth for most strokes, and grab a new rag whenever one gets soaked.

Next, "dry-brush" any cracks or crevices that the rag couldn't reach by dragging a dry brush through them (**Photo 6**). Wipe off the bristles on a rag or newspaper between strokes to keep the bristles dry and to avoid smearing. Don't waste time. It doesn't take long for stain to start drying, and it becomes sticky and hard to remove. If the stain gets tacky before you can wipe it off, simply apply more stain to soften it and then wipe it off again.

Finally, closely examine the surface for smudges, brush marks and blotches. Look for swirls left by rags and wipe them down again. These marks are easy to miss but you *will* see them after finishing, so examine the surface carefully.

If you spot areas in the finish that seem too light, add more stain. Let it sit for a couple of minutes and then wipe it off again. Work quickly; as the stain dries, it will smudge. Lighten dark areas by rubbing them lightly with a rag dampened with paint thinner. Make these color tune-ups for each piece right after staining. It's easiest to make color corrections while the stain is still damp. Let the stain dry overnight before you start the finish coats. If you're unhappy with grain lines that are too dark compared with the surrounding wood (**Photo 5**), restain and wipe the whole surface and let it sit overnight again.

Brush on a sanding sealer

Brush on the sanding sealer in the direction of the grain until the whole surface is coated (**Photo 7**). Shine a strong light on the wet surface to highlight areas you might have missed (they'll be dull). Then add more finish wherever it's needed. Immediately "tip-off" the wet finish by stroking the entire surface from end to end with long, light, overlapping strokes of the wet brush (**Photo 8**). That'll further even out the coat and help eliminate brush marks. Work quickly; sanding sealers dry fast. If you wait too long before tipping off, you'll leave brush marks. If you see brush marks after tipping off, leave them and sand them out later. Lastly, look carefully at the edges to find any drips and smooth them out with the brush. Leave the wood lying flat during the finish application and while it dries afterward. That'll minimize runs and sags and help finishes to "level out" so brush marks will disappear.

Sand the sealer before varnishing

After the sealer dries, lightly sand the surfaces with 240- or 280-grit (extra fine) sanding pads or paper. You'll know it's smooth enough when you see a fine dust on all the surfaces and they're smooth to the touch (**Photo 9**). The sanded surface should be uniformly dull. Shiny streaks or spots indicate missed spots.

Sand carefully, especially near sharp corners. It's easy to sand through the sealer and the stain to leave exposed raw wood. If that happens, just retouch with more stain to even up the color. There's no need to reseal small areas. Use a shop vacuum fitted with an upholstery brush to remove most of the dust. Remove the remaining dust by wiping the surfaces with a tack cloth (**Photo 10**).



10 **Vacuum most of the dust from the surface, then wipe off the remainder with a tack cloth. Then brush varnish over the entire surface, tipping it off to minimize brush marks.**

Finish up with oil-based varnish

Brush on the varnish and tip it off with the same techniques you used for the sanding sealer (**Photo 8**). If you're working in a clean room and did a good job of sanding the sealer, one coat will be plenty. Trim doesn't receive much wear or abrasion, so you don't need a tough, thick finish. But if you have dust specks, brush marks or other imperfections, don't try to pick them out of the wet finish. Let the finish dry overnight. If there are only a few specks, pick them out with your fingernail. If there are a lot of specks, resand and add another coat. Either way, specks in the finish mean the room is still dirty. Clean the room more thoroughly or find another, cleaner place to work for the next coat. To add another coat, prepare the surface as you did after the sanding sealer, including sanding the finish with extra-fine sanding grits, dusting the surfaces and wiping everything down with a tack cloth. Then add another topcoat of varnish.

Art Direction • BECKY PFLUGER
Photography • MIKE KRIVIT
Consultants • GARY HAKKENEN, EMPIRE PAINTING; BRUCE KIEFFER, KIEFFER FURNITURE





Coat rack & storage bench

by Gary Wentz

Clear entryway clutter with this stylish cherry combo

If your entryway is littered with shoes and jackets, purses and book bags, this simple bench and matching shelf might be just what you need. With coat hooks and shelves, they provide an orderly home for all that clutter. Even if you already keep your entryway neat and tidy, these stylish pieces will dress it up and give you a convenient seat while you pull on your shoes.

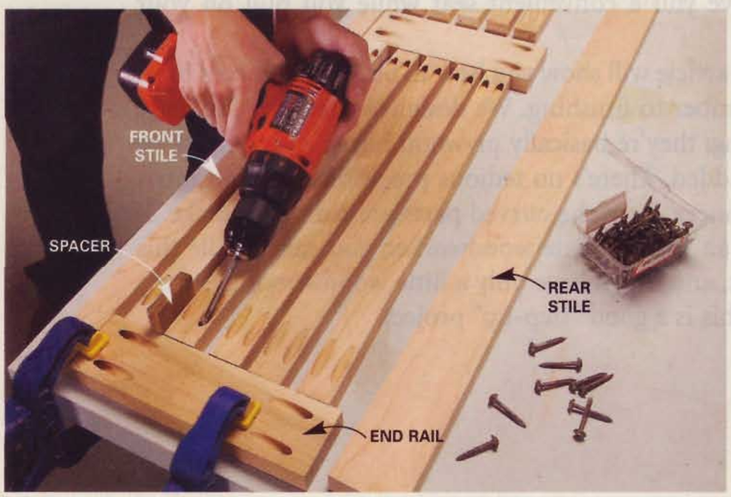
This article will show you how to build both pieces from raw lumber to finishing. We designed them for fast, easy building; they're basically plywood boxes with decorative parts added. There's no tedious precision work, no intricate joinery. Even the curved parts are simple to make. If you're an intermediate woodworker, you can handle this project, and if you have only a little woodworking experience, this is a good "step-up" project.



1 Rip the parts for the grille. Cut all the slats to identical lengths using a bump jig. Make fine length adjustments by turning the lag screw in or out.



2 Drill pocket holes in the grille parts. To avoid confusion, lay out the grille with the best-looking side of each piece face down. Put each part back in place after drilling.



3 Assemble the grille with pocket screws. Screw the front stile to one end rail first, then position the slats using a 7/16-in. spacer. Attach the rear stile last.

Time, money and tools

Building this set will take you two or three days, plus a few hours of finishing work. We built ours from cherry boards and cherry plywood. Cherry is expensive: Our total materials bill was $250 (see the Materials List for everything you'll need). Made from oak, our ensemble would cost about $125. A maple or birch set would cost $160. For a more rustic look, use construction-grade pine and plywood and spend less than $100.

This project requires two special tools: a table saw to rip solid wood to width and a pocket screw jig ($60) to make strong butt joints. If you don't own a pocket screw jig, buy one. It's a good investment and is easy to use. In addition, you'll need a drill, miter saw, random orbital sander and jigsaw. An air-powered 2-in. brad nailer isn't absolutely necessary, but it'll save lots of time and give you better results.

The bench begins as a box

The box that forms the core of the bench is made mostly from 3/4-in. plywood. For the floor of the box, we made a grille from solid wood slats. You could save a couple of hours by using a 12-in. x 44-in. piece of plywood instead, but a slatted grille looks better.

Rip the grille parts to the widths shown in the Cutting List (p. 64) and then cut them to length. All the slats (A) must be precisely the same length, so make a simple bump jig from plywood scraps and a lag screw (**Photo 1**). Clamp your miter saw and the bump jig to your workbench and make the repetitive cuts.

Pocket screws make assembling the grille fast and easy (**Photos 2 and 3**). For tips on using a pocket screw jig, see "Using Tools," Feb. '03, p. 23. (To order a copy, see p. 5.) Use wood glue on your pocket screw joints later in this project, but skip the glue when you assemble the grille—removing excess glue from between the slats is nearly impossible. When the grille is complete, sand all the joints flush with a random orbital sander and a 100- or 120-grit disc. Then switch to a 150- or 180-grit disc and sand the entire surface. Use this same sanding

Plywood cutting diagram

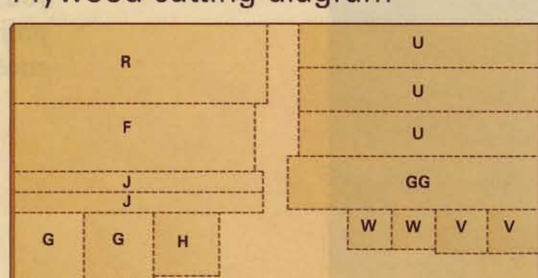


Figure A
Bench—exploded view

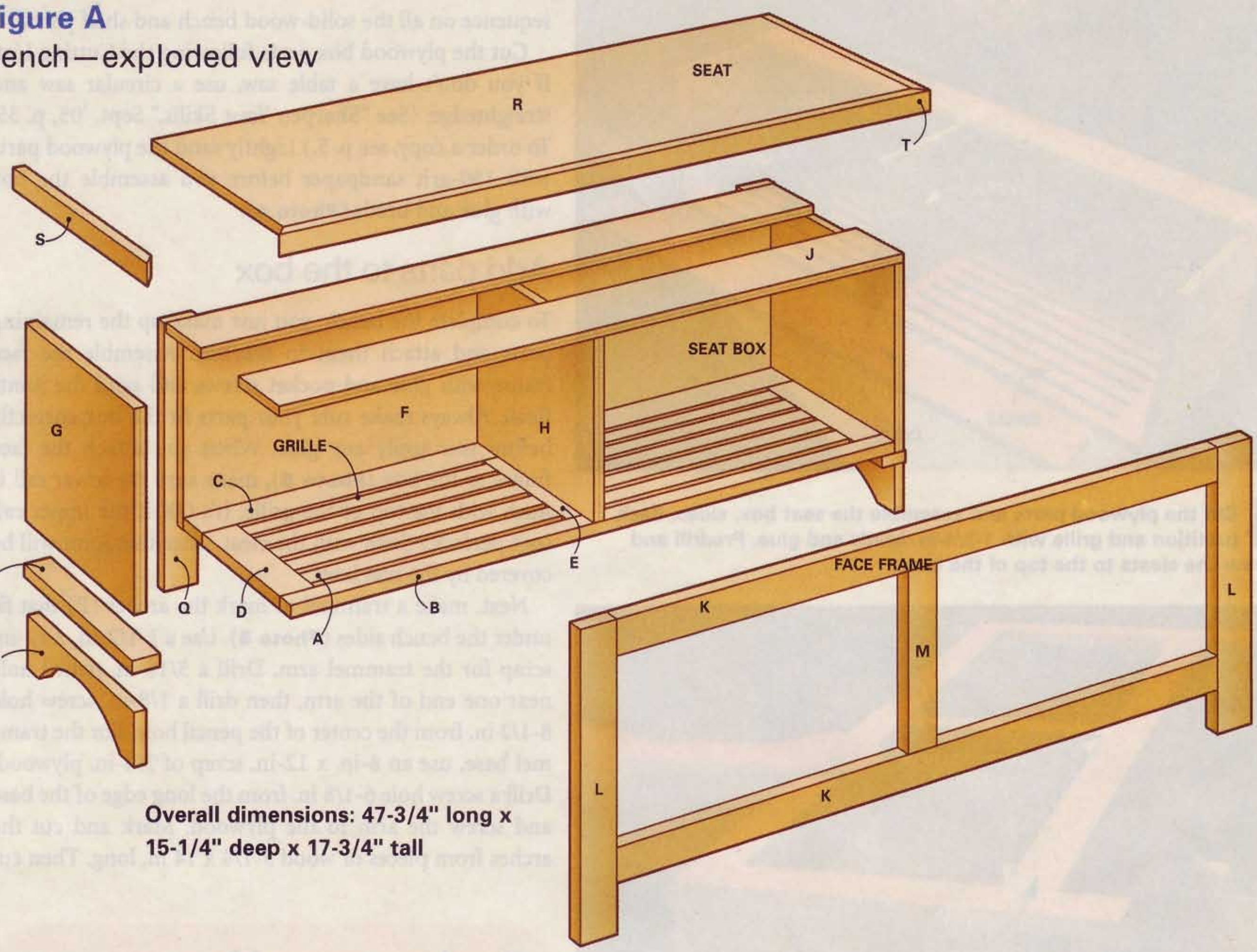
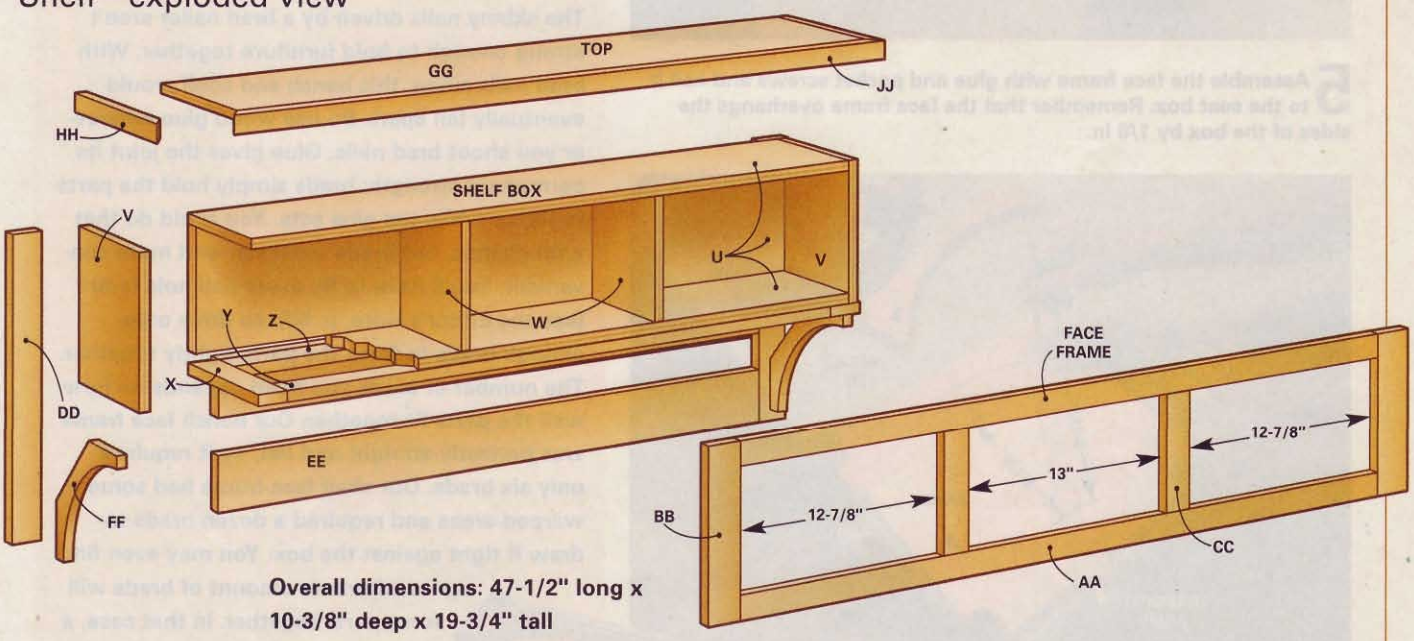
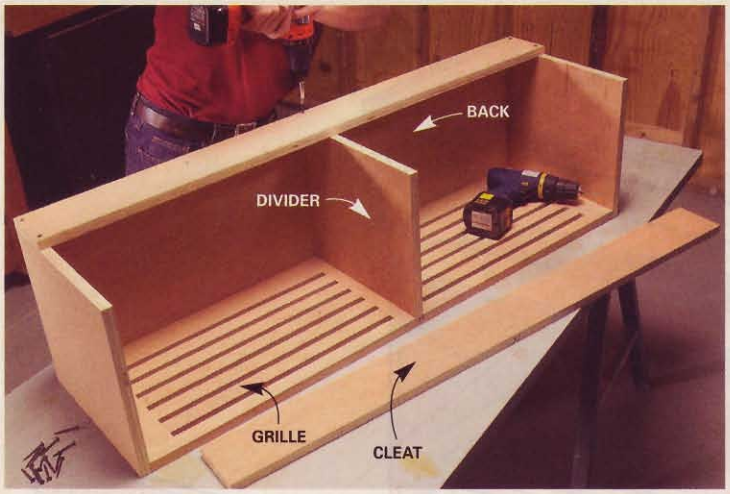
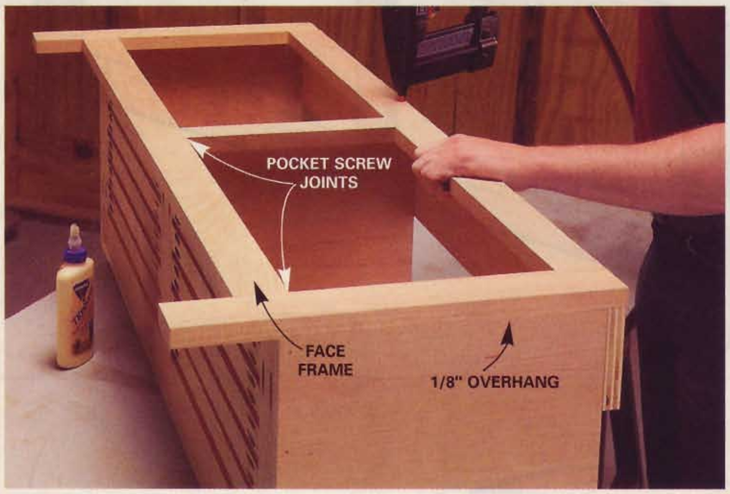


Figure B
Shelf—exploded view

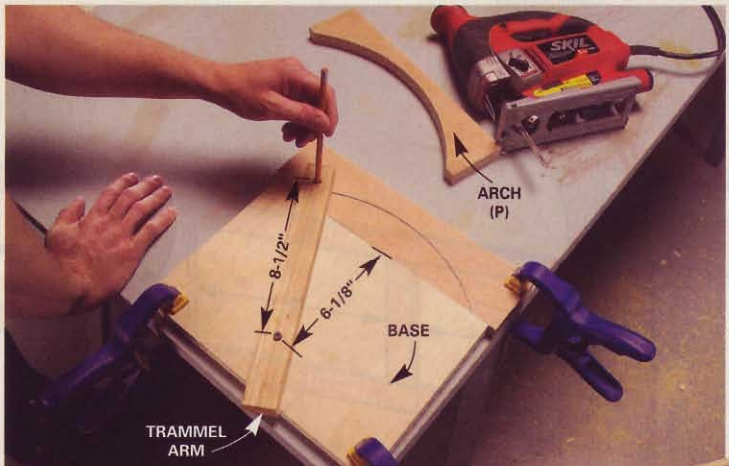




4 **Cut the plywood parts and assemble the seat box, sides, back, partition and grille with 1-3/4-in. brads and glue. Predrill and screw the cleats to the top of the box.**



5 **Assemble the face frame with glue and pocket screws and nail it to the seat box. Remember that the face frame overhangs the sides of the box by 1/8 in.**





6 **Draw an 8-1/2-in.-radius arc using an arc jig. Cut the arch with a jigsaw and sand it smooth. When you cut the arch to length, trim from both ends to center it.**

sequence on all the solid-wood bench and shelf parts.

Cut the plywood box parts following the Cutting List. If you don't have a table saw, use a circular saw and straightedge. (See "Sharpen Your Skills," Sept. '05, p. 35. To order a copy, see p. 5.) Lightly sand the plywood parts with 150-grit sandpaper before you assemble the box with glue and brads (**Photo 4**).

Add parts to the box

To complete the bench, you just make up the remaining parts and attach them to the box. Assemble the face frame with glue and pocket screws and sand the joints flush. Always make sure your parts fit the box correctly before you apply any glue. When you attach the face frame to the box (**Photo 5**), make sure the lower rail is flush with the top of the grille. It's OK if the upper rail isn't perfectly flush with the cleat, since that joint will be covered by the seat later.

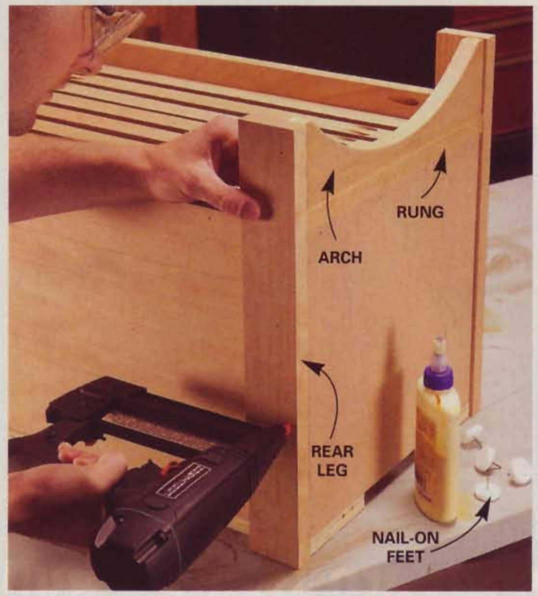
Next, make a trammel to mark the arches (P) that fit under the bench sides (**Photo 6**). Use a 1-1/2-in. x 12-in. scrap for the trammel arm. Drill a 5/16-in. pencil hole near one end of the arm, then drill a 1/8-in. screw hole 8-1/2 in. from the center of the pencil hole. For the trammel base, use an 8-in. x 12-in. scrap of 3/4-in. plywood. Drill a screw hole 6-1/8 in. from the long edge of the base and screw the arm to the plywood. Mark and cut the arches from pieces of wood 3-1/4 x 14 in. long. Then cut

Furniture assembly with a brad nailer

The skinny nails driven by a brad nailer aren't strong enough to hold furniture together. With brad nails alone, this bench and shelf would eventually fall apart. So use wood glue wherever you shoot brad nails. Glue gives the joint its permanent strength; brads simply hold the parts together while the glue sets. You could do that with clamps, but brads are faster and more convenient. You'll have to fill every nail hole later (see the Editor's Note, p. 68), so drive only enough brads to force the parts tightly together. The number of brads you need depends on how well the parts fit together. Our bench face frame was perfectly straight and flat, so it required only six brads. Our shelf face frame had some warped areas and required a dozen brads to draw it tight against the box. You may even find spots where no amount of brads will force parts together. In that case, a well-placed clamp or two will hold parts tight until the glue sets.

rungs (N). Don't rely on our Cutting List when you cut the rungs and arches to length—instead, set them into place and mark them flush with the back of the bench. Glue and nail them into place and add the rear legs (Q; **Photo 7**). We nailed 3/4-in. plastic feet to our bench. Plastic can stain wood finishes. So if you plan to put your bench on a wood floor, use cloth or felt pads instead.

The seat is simply a slab of plywood (R) banded on



7 Nail the rungs to the underside of the box. Then add the arches and rear legs. Add plastic feet or felt pads after the glue sets.

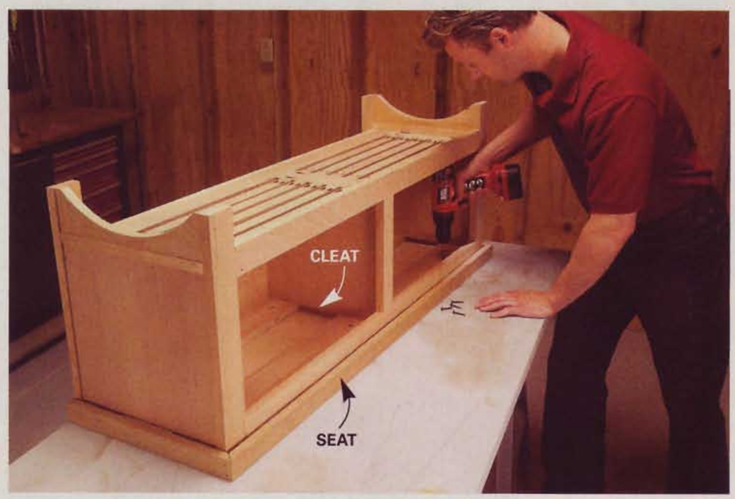
Cutting List

KEY	QTY.	SIZE & DESCRIPTION
A	10	1-1/8" x 18-1/4" (slats)
B	1	1-1/8" x 44" (front stile)
C	1	2-1/4" x 44" (rear stile)
D	2	2-1/4" x 8-5/8" (end rails)
E	1	3" x 8-5/8" (middle rail)
F	1	12-1/4" x 44" (back panel)
G	2	12-1/4" x 12-3/4" (end panels)
H	1	11-1/2" x 12" (divider)
J	2	3-3/4" x 45-1/2" (cleats)
K	2	2" x 41-1/4" (upper and lower rails)
L	2	2-1/4" x 17" (front legs)
M	1	1-3/4" x 10-1/4" (middle stile)
N	2	1-1/2" x 12-3/4" (rungs)
P	2	3-1/4" x 12-3/4" (arches)
Q	2	2-1/4" x 17" (rear legs)
R	1	14-1/2" x 46-1/4" (seat panel)
S	2	1-1/2" x 15-1/4" (side bands)
T	1	1-1/2" x 47-3/4" (front band)
U	3	8" x 44" (top, bottom, back)
V	2	8" x 9-1/2" (end panels)
W	2	7-1/4" x 8" (dividers)
X	2	2" x 8" (stiles)
Y	1	1-1/4" x 41-3/4" (front rail)
Z	1	2" x 41-3/4" (rear rail)
AA	2	1-1/2" x 41-3/4" (upper and lower rail)
BB	2	2" x 10-1/4" (end stiles)
CC	2	1-1/2" x 7-1/4" (divider stiles)
DD	2	2" x 19" (rear stiles)
EE	2	3-1/2" x 41-3/4" (coat hook rails)
FF	2	3-1/2" x 11-1/2" (brackets)
GG	1	9-5/8" x 46" (top panel)
HH	2	1-1/4" x 10-3/8" (side band)
JJ	1	1-1/4" x 47-1/2" (front band)

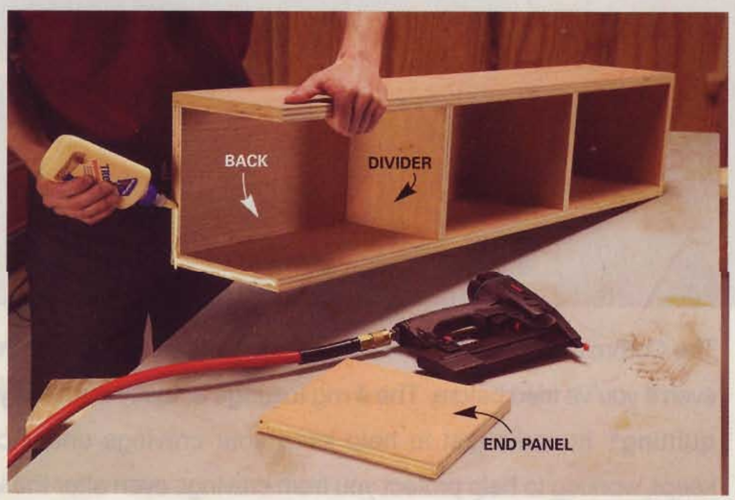
Materials List

- One 4' x 8' sheet of 3/4" plywood
- 18 board ft. of solid wood (that's 36 linear feet of 1x8)
- 1-1/4" screws
- 1-3/4" and 2" brads
- 3/4" plastic or cloth feet
- Wood glue
- Wood filler
- 5 cans of spray lacquer
- Coat hooks (we used three large and two small)

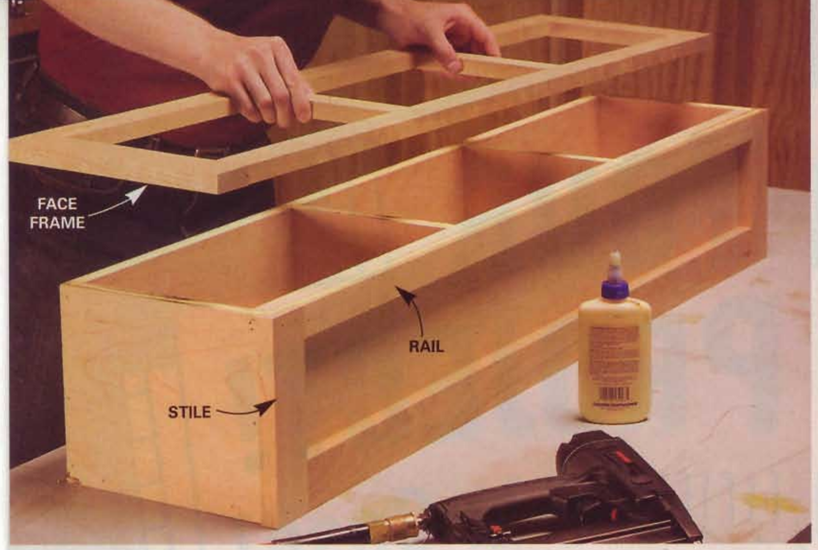
Pocket screw jig No. KTR2, $53, Woodworker's Hardware, (800) 383-0130. www.woodworkershardware.com



8 Cut the seat from plywood and cover three edges of it with solid wood. Fasten the seat to the bench with 1-1/4-in. screws driven through the cleats.



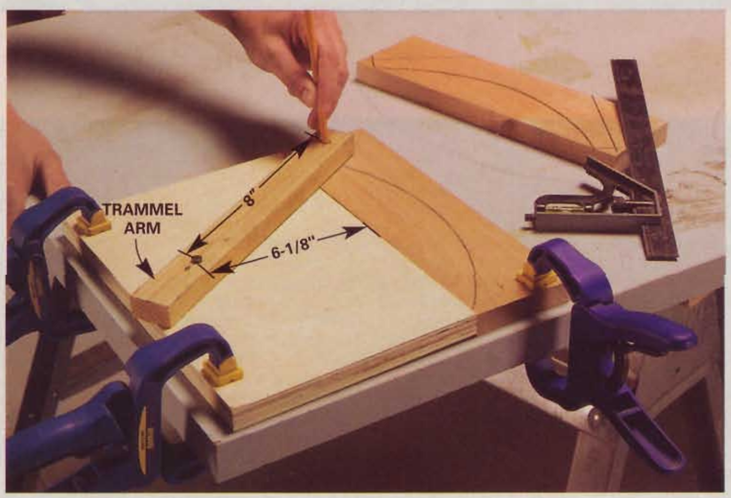
9 Cut out the shelf box parts. Glue and nail the bottom to the back first. Then add the dividers, the top and finally the end caps.



10 Nail rails and stiles directly to the underside of the shelf box. Assemble the face frame with pocket screws and nail it to the front. After the glue sets, sand all the joints smooth.



11 Assemble the back frame with pocket screws, sand the joints flush, and fasten it to the shelf box. Then assemble the shelf top and attach it with glue and brads.



12 Draw an 8-in.-radius arc for the shelf brackets using the arc jig. Cut the arches using a jigsaw and the straight cuts with a miter saw set at 45 degrees.

Coat rack and bench

three sides with solid wood (S, T). Mitering the banding accurately can be difficult and frustrating. Make the joints tight by trial and error. Start by mitering parts about 1/8 in. too long. Hold them in place to check the fit, then readjust the angle on your miter saw and shave a hair off the parts again and again until they fit perfectly. Although mitered joints look best, you may prefer to band the seat with square-cut wood if you don't have

Editor's Note
A no-curse strategy for invisible nail holes

The wood fillers that fussy carpenters use to hide nail holes in trim (see p. 72) aren't a good choice for furniture projects. They stay soft for years, so they're not sandable and they can rub off on clothing. Fussy furniture makers prefer fillers that dry hard. These sandable fillers are often labeled "stainable," but they usually absorb more or less than the surrounding wood, leaving light or dark dots at each nail hole.

After years of cursing at nail dots, I gave up trying to make wood fillers match wood. I gave up the cursing, too, because I discovered a technique that works every time. The key is to make the patches lighter than the surrounding finish and darken them later. These extra steps may sound like a lot of trouble, but they add only a few minutes to the process:

- Buy the lightest color of filler available.
- Before you fill the holes on your project, shoot a few nails into a wood scrap and fill those holes. When dry and sanded, the filler must be no darker than the wood.
- Apply stain or clear finish to the test scrap first. In most cases, the nail patches remain lighter than the wood. If they turn darker, "pretreat" them so they absorb less finish. Mix two drops of wood glue with a drop of water and apply the thinned glue to the patches with a fine-tip artist's brush. Keep glue off the surrounding wood. After about 30 minutes, lightly sand each nail patch.
- Stain and finish the wood as usual. But before you apply the final coat of clear finish, use a fine-tip marker to darken each nail patch. An art supply store is the best source for a wide variety of colors. With two or three different markers, you can match the differing wood tones in your project and the nail holes will be invisible to everyone but you.

Gary





13 **Glue, position and clamp the upper end of each bracket and fasten the other end with screws driven from behind. Predrill so you don't split the bracket.**



14 **Level and screw 2-in. x 8-in. cleats to wall studs. Set the shelf on the cleats and screw through the back of the shelf into the cleats using 1-1/2-in. brass screws and finish washers.**



experience with miters. Screw the seat to the bench without glue (**Photo 8**) so you can remove the seat while finishing the bench.

Build the shelf just like the bench

In terms of construction and techniques, the shelf is just a smaller variation of the bench. It starts with a plywood box (**Photo 9**). The top, bottom and back of the box are identical parts (U). Be sure to place the back *between* the top and the bottom pieces. Add rails and stiles to the underside of the box, then assemble and attach the face frame (**Photo 10**). The back frame (**Photo 11**) provides a mounting surface for coat hooks later. Make the shelf top just as you made the bench seat: Wrap a piece of plywood (GG) with solid wood banding (HH, JJ). When you nail the top to the shelf box, use plenty of glue—the top will support the entire weight of the shelf when you hang it on the wall (see **Photo 14**). Draw the arc for the shelf brackets using the same arc jig you used to make the bench arches—just be sure to reposition the screw 8 in. from the pencil hole (**Photo 12**). If you don't have a clamp that's long enough to hold the bracket against the shelf box (**Photo 13**), tack it into place with 2-in. brads.

A fast finish

If you remembered to sand all the parts before assembly, you won't have much prep work before finishing. Just fill the nail holes (see Editor's Note, p. 66) and inspect all the glued joints for glue smudges.

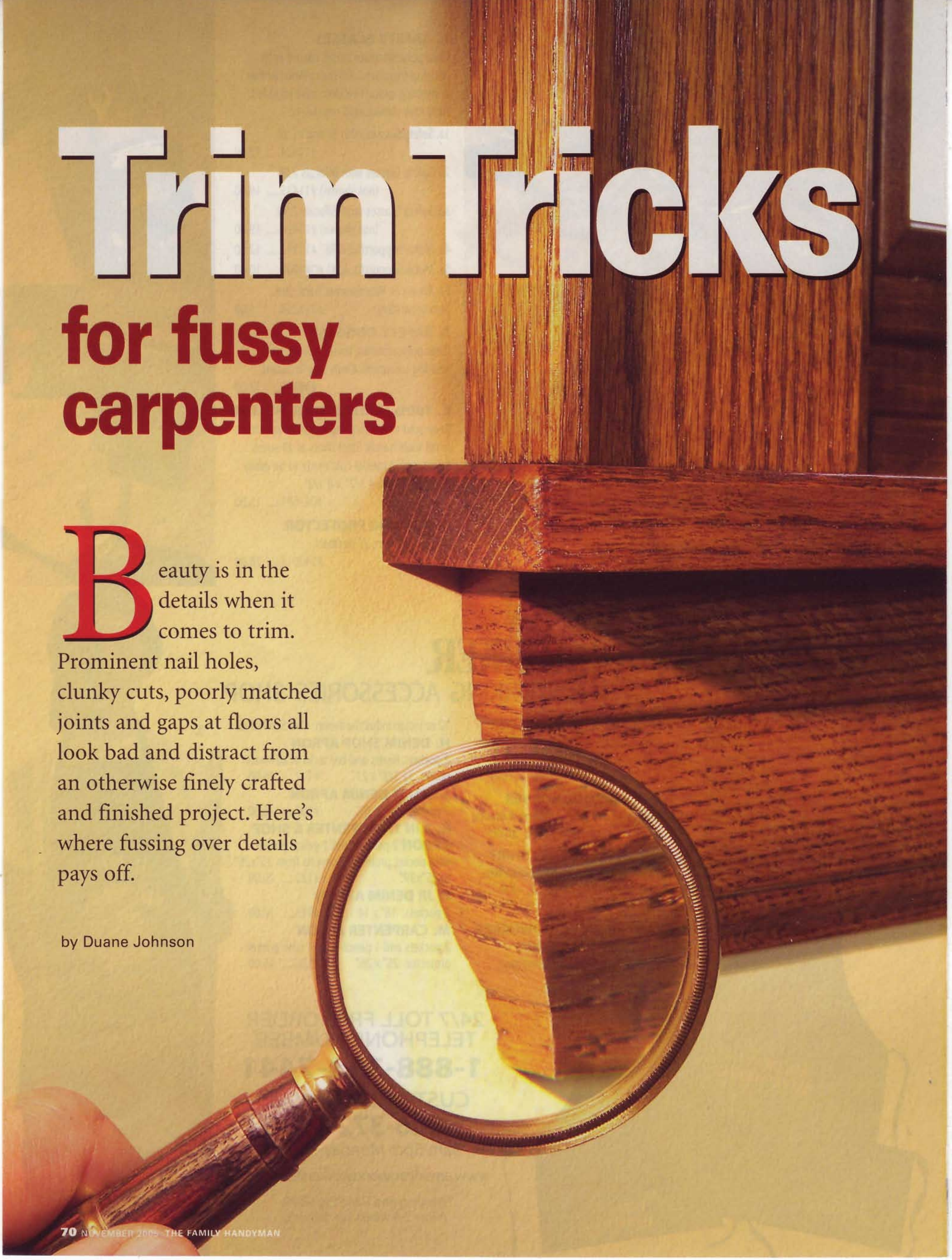
Cherry usually doesn't take stain evenly, so we skipped the stain and applied a clear finish only. With the bench and shelf's corners and cramped spaces, brushing a finish on them would be a nightmare. That's why we chose a spray-on lacquer finish. Lacquer is one of the fastest, easiest finishes to apply. Here's how to use it:



- Wear an organic vapor respirator ($25) and spray the lacquer outdoors or in the garage with the door open. Lacquer contains nasty solvents.
- Spray on two very light coats, wait 30 minutes and lightly sand with 220-grit paper.
- Vacuum off the sanding residue and apply two or more light coats until you get the look you want. There's no need to sand between coats unless specks of dust settle on the finish.

Let the finish harden overnight before you add the coat hooks and hang the shelf (**Photo 14**).

Art Direction • MARCIA WRIGHT ROEPKE
Photography • BILL ZUEHLKE
Technical Art • FRANK ROHRBACH III



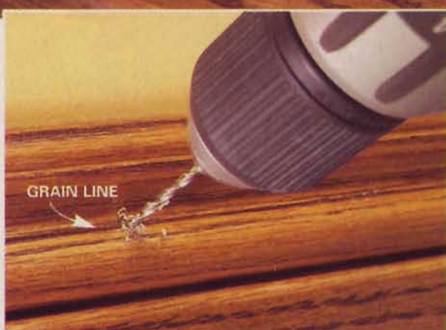
Trim Tricks

for fussy carpenters

Beauty is in the details when it comes to trim. Prominent nail holes, clunky cuts, poorly matched joints and gaps at floors all look bad and distract from an otherwise finely crafted and finished project. Here's where fussing over details pays off.

by Duane Johnson





1 Predrill and drive nails in the darker grain lines when possible. Holes are much easier to hide.



2 Touch up bad matches with a colored felt-tip pen. Or drill out the old putty and refill.

Hide those nail heads

If you want your trim work to have a rustic, distressed look, go ahead and make the nail holes stand out. But if you're seeking a smooth, furniture-like finish, you have to make those nail holes disappear. Hiding nail holes takes a little more time and patience, but you'll get the fine, flawless appearance you want.

Begin by staining and sealing the trim before you put it up. Then buy colored putties to closely match the stain colors on the wood (**Photo 3**). (The other option, filling the holes with stainable filler before staining, is tricky unless you have a lot of experience. (See "Coat Rack & Storage Bench," p. 50.) Prestaining also makes the darker grain lines of the wood stand out. Position your nails there for the least visibility.

Buy several putty colors and mix them to match the wood color. Wood tone is rarely uniform, even when the wood is stained, so you can't rely on only one color to fill every hole (**Photo 3**). Fine-tune your blends, and set your test piece alongside the trim to check the visibility of the nail holes under real light conditions. Lighting can significantly affect whether the filler blends or stands out.

Keep in mind that you can correct past mistakes or fix a situation where the wood has darkened after a year or two (with cherry, for example). Simply buy woodtone felt-tip pens and touch up the filler. (**Photo 2**). Or lightly drill out the most unsightly old filler holes with a small drill bit and refill them. Minwax is one common brand of colored putties and touchup pens (800-523-9299) available at most hardware stores and home centers.

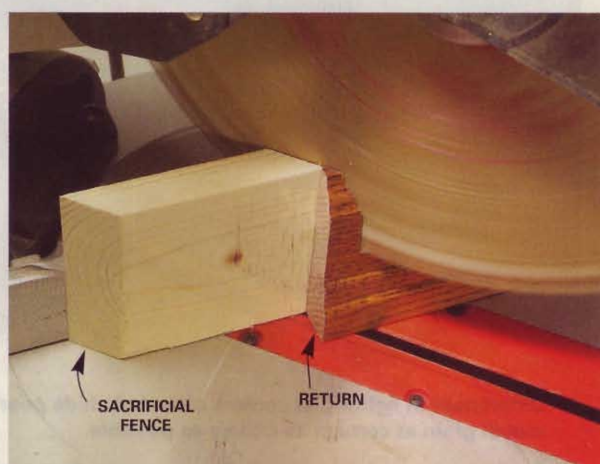


3 Blend putty colors to more closely match the finished wood colors. One color won't do all.

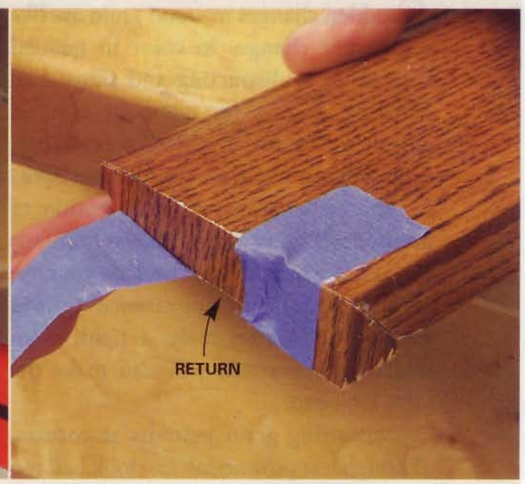


End your trim with returns

When baseboard, chair rail or a window apron simply ends in the middle of a wall, don't leave a cutoff end. It'll look clunky and ruin the appearance of otherwise finely crafted trim (**photo above**). It's far more attractive to make this awkward transition with a simple return. A return is just a miter that turns a corner and ends abruptly at the wall. It hides the end grain and emphasizes the attractive molding profile.



1 Cut the return at a 45-degree angle, using a 1x3 "sacrificial fence" for a backer. Make the cut as fine as possible.



2 Spread glue on the mitered edges and tape the return tightly to the trim.

The tough part about making the return is cutting and fastening such a small, fragile piece. It usually flies off the power miter saw and breaks. One good solution is to cut it against a temporary sacrificial fence, which gives the trim piece full support (**Photo 1**). Use the tallest fence your miter saw blade guard allows for maximum support. Even so, some profiles are simply too fine to cut cleanly. In that case, cut off the return, leaving a little extra length. Then belt-sand off the excess on the backside after you glue the return to the main piece (**Photo 2**).

Returns usually split if you try to fasten them with nails, even if you use an air nailer. Gluing works better. Wrap them with tape from the backside to clamp the mitered corner just right. Or if you're in a hurry, use fast-setting epoxy (five minutes or less) and simply hold the return in place until the epoxy sets.

For a really sharp look, cut the return off the end of the same trim piece so it looks as though the grain turns the corner.



Match wood grain at joints

Sudden changes in wood grain are like abrupt changes in color in painted trim. They're distracting and signal bad planning. Always lay out your trim in advance to show off the best grain patterns. Choose the least conspicuous spots for the rest. Pay particular attention to joints. Scarf joints (joints in a continuous run) are the most critical because your eye expects a uniform appearance (**photo above**). Of course, make a tight, clean joint too; a poor fit will also make the joint look bad.

Contrasting grain patterns at corners, although less prominent, can look bad too (**Photos 1 and 2**).

Trim is expensive, but it's often worth buying 10 to 20 percent extra just to have more placement options. And although it's fussy, cutting a single piece of trim to flow around prominent outside corners lends a subtle touch of class to your trim. Others may not notice the matching grain pattern, but you will.

tip

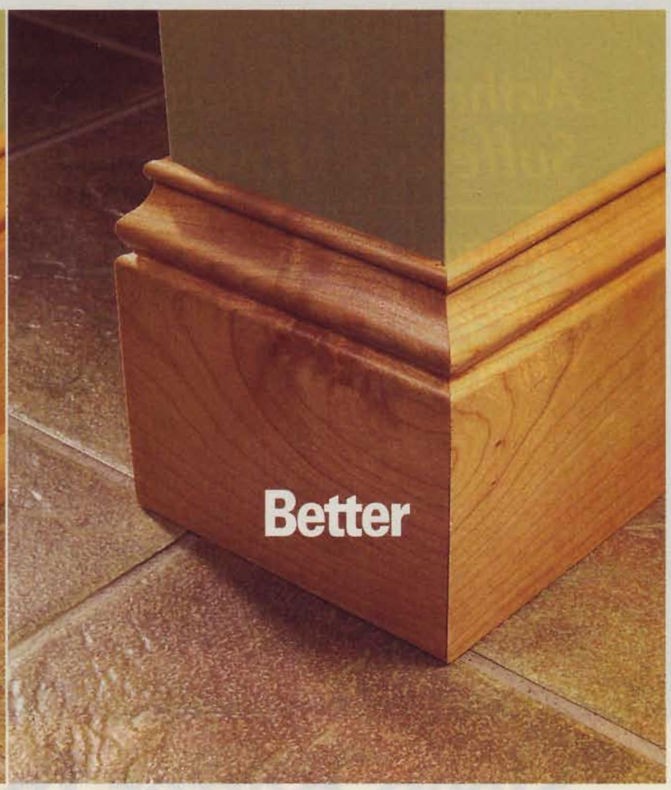


1 Differences in lighting at corners often help hide poor grain matches. Still, try to match grain at corners as closely as possible.



2 Either a wide grain pattern or a narrow one can look fine as long as each is consistent at joints.





Scribe the base to the floor (and skip the shoe)

Base shoe looks great with larger baseboard but often looks clunky with the smaller or slimmer sizes that are standard today. You'll also see gaps if the floor is uneven (**photo above**). Don't hesitate to eliminate base shoe if you can fit your baseboard tightly to the floor. Along floors with waves and dips—tile, for example scribe the bottom before you install it. The final fit will look clean and sharp.



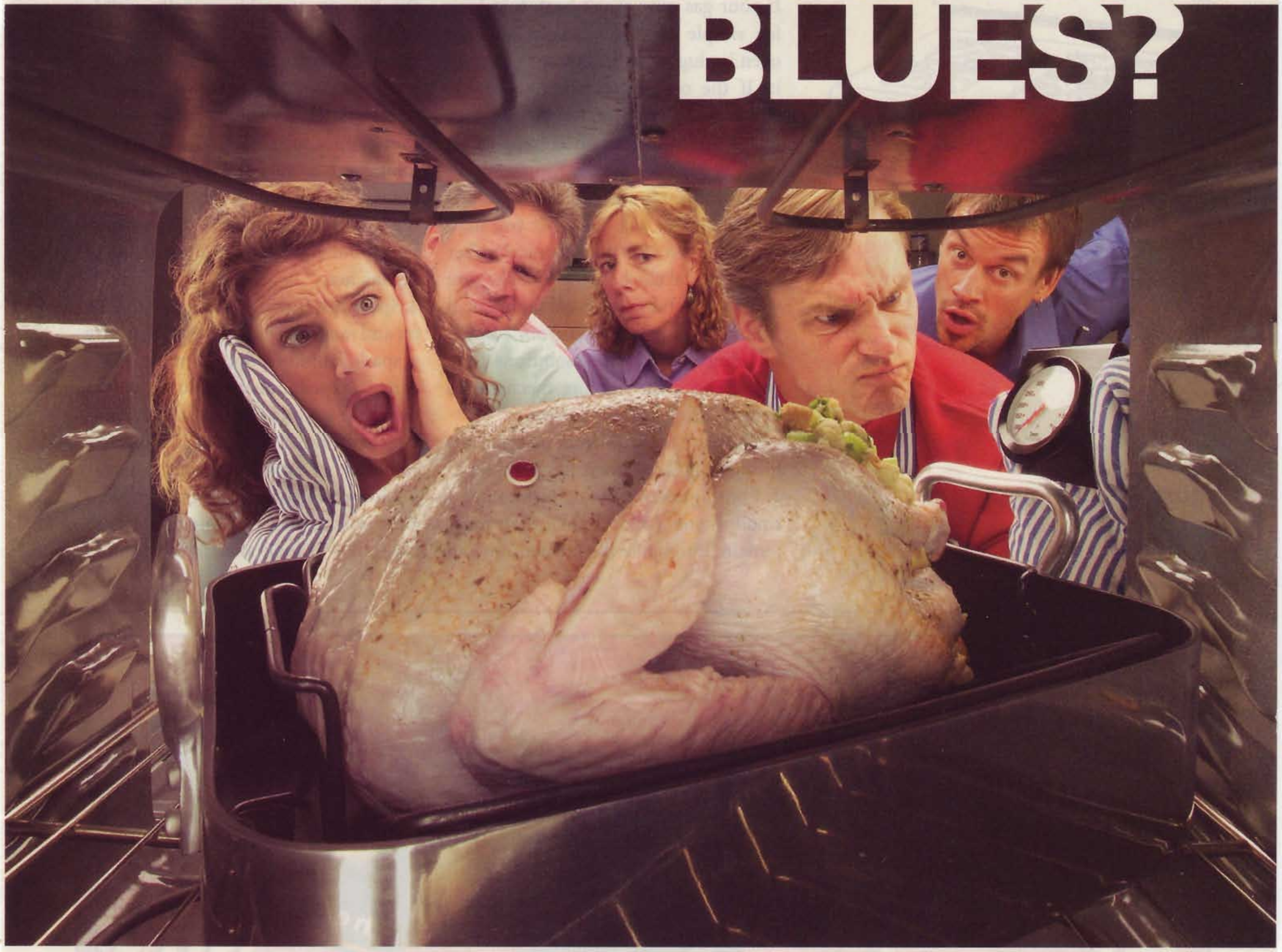
1 Set the baseboard in place and run a thick pencil along the floor, marking the floor dips and humps.

2 Sand to the line with a belt sander until the profile matches the floor. Angle the sander toward the back and fine-tune the outer edge for a closer fit.

Art Direction • BOB UNGAR
Photography • BILL ZUEHLKE

Got the BUSTED APPLIANCE BLUES?

by Jeff Gorton



Oven won't heat? Clothes won't dry? Fix your oven and clothes dryer yourself and avoid expensive service calls

If you're like most people, you reach for the Yellow Pages when an appliance breaks down. After all, it's pretty tough to be without an oven or a clothes dryer for very long, and most of us don't have a clue where to start looking for the problem. But surprisingly, many common appliance breakdowns are easy to diagnose and fix. With little more than an inexpensive multimeter and nut drivers, you can do many repairs yourself and save hundreds of dollars. In this article, we'll show you how to find and fix some problems you're likely to have with ovens and dryers.

The parts for these repairs, none of which will take more than a few hours, will cost $15 to $60. You'll need the model number and serial number of the appliance to buy parts. Look for the tag with this information under the lid of washers and dryers, or behind the door or bottom drawer of ovens. To find parts, check the Yellow Pages under "Appliance Parts," go online to a parts service like Sears Parts Direct (www3.sears.com), or contact the manufacturer.

Problem: Gas oven won't heat

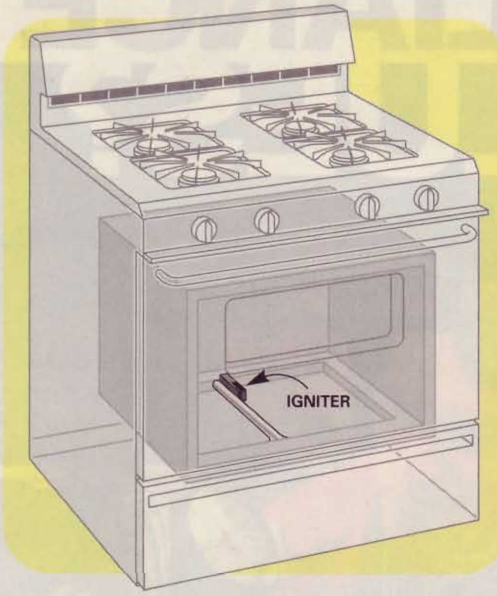


Figure A Gas oven

Solutions:

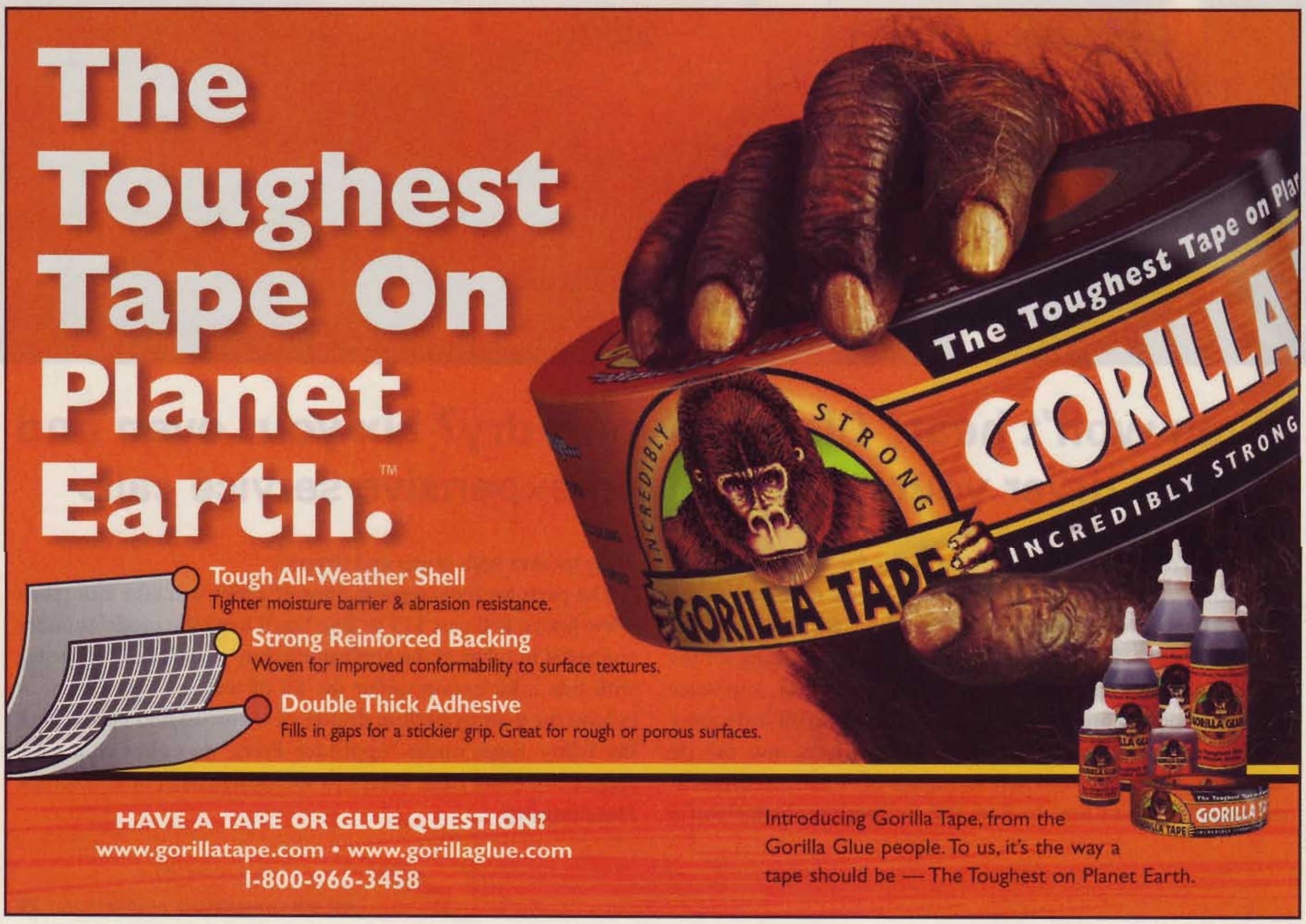
If your gas oven won't heat, first look for simple problems. Make sure the oven is plugged in and there's power to it. If the oven light won't come on, check the receptacle for power. Our repair pro tells us he often "repairs" an oven by plugging it in or flipping a circuit breaker. He still has to charge $50 for the service call. Ouch! If you have an older oven with a mechanical rather than a digital clock, check to make sure you haven't bumped it off the manual setting. This will keep it from coming on immediately. If these solutions don't work, check the lighting mechanisms before calling a repair service.

There are three different mechanisms for lighting the burners in gas ovens:

1. Pilot lights. A pilot light oven has a small flame (pilot light) that must remain lit to ignite the burner. You can identify a pilot light oven by looking at the burner assembly, usually visible through the broiler drawer opening. You'll see a gas tube with a "thermocouple" mounted near its tip. The thermocouple is a small cylinder with a thin copper tube leading to it. If your pilot light is out, refer to your stove manual for lighting instructions, or call the local gas company. Few ovens now have pilot lights, and we won't cover repairs here.

2. Spark ignition. If you turn your oven on and normally hear clicking, you have a spark ignition pilot assembly. It's a pencil-shaped porcelain tube with a metal tip on one end and a wire running to the other end. Since it, too, is less common, we won't cover repairs here.

3. Glow coil igniters. If your oven has a glow coil igniter (the most common type), it will look similar to the ones

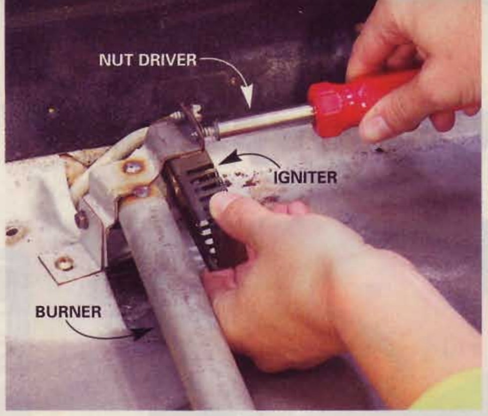


shown in **Photo 2**. You can spot it at the rear of the burner (**Figure A** and **Photo 1**). When you turn on the oven, the igniter should glow brightly, signaling the gas valve to open and lighting the burner.

If the igniter is bad, it won't open the gas valve and your oven won't come on. If the igniter fails to glow, glows dimly or fails to light the burner after glowing for 30 to 45 seconds, replace it (**Photos 1 and 2**).

Start by removing the oven racks and lifting out the metal burner cover on the bottom of the oven compartment. Then follow the steps in **Photos 1 and 2**. Your oven may look a little different, but the procedure is the same. This is also a good time to clean out the little holes in the burner with a stiff-bristle brush.

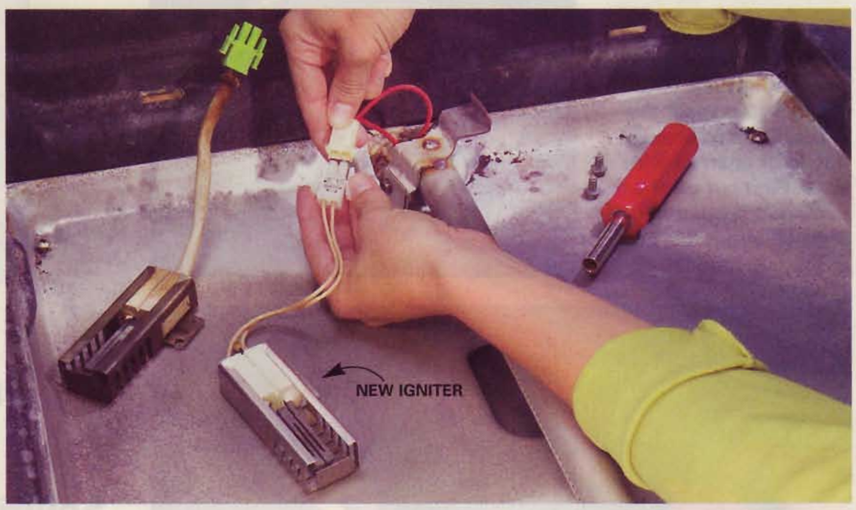
A new oven igniter will cost $35 to $60. Handle the new igniter carefully and avoid touching the dark gray element. Body oil will decrease the life of the igniter.



Replace a glow-type igniter

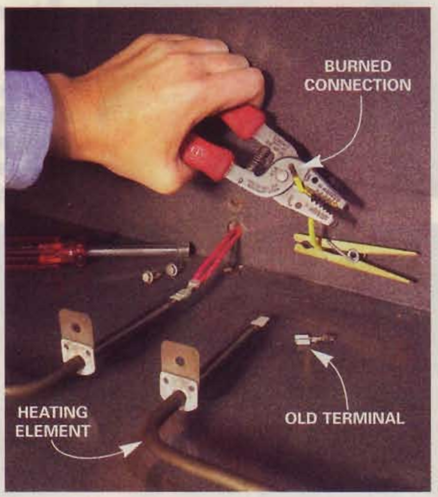
1 Unplug the oven, lift out the burner cover and remove the screws that secure the igniter.

2 Disconnect the terminals and plug in a new igniter. Reinstall it. Tuck the wires back down and attach the igniter with screws.



Problem: Electric oven won't heat

Replace bad wire ends



1 Remove the mounting screws and pull the element out far enough to inspect the wires. Replace broken, frayed or charred wire ends. First cut off the damaged section and strip off about 3/8 in. of the insulation.



2 Slip the stripped wire into the new terminal. Align the barrel of the terminal with the 14-16 wire gauge notch labeled "noninsulated." Squeeze to crimp the terminal onto the wire.

Replace the heating element

Test the element by touching the ends with the two probes of a multimeter. Set the tester to RX-1. The needle should move to the right. If it doesn't, replace the heating element.



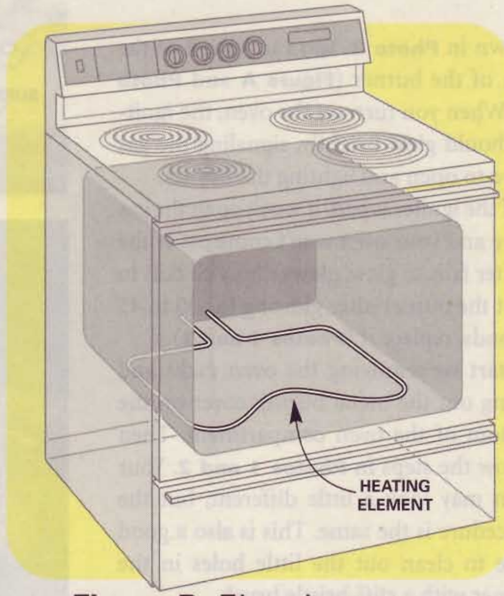


Figure B Electric oven

Solutions:

If your electric oven won't heat, there's a good chance the heating element has a bad connection or is burned out. But before you dive into this repair, check to make sure the circuit breaker (double pole for 240 volts) hasn't switched off. If your oven heats somewhat and the light still comes on, check the receptacle with a voltage tester (about $4 at home centers and hardware stores) capable of testing 240-volt circuits. Call in an electrician if it's not getting at least 200 volts.

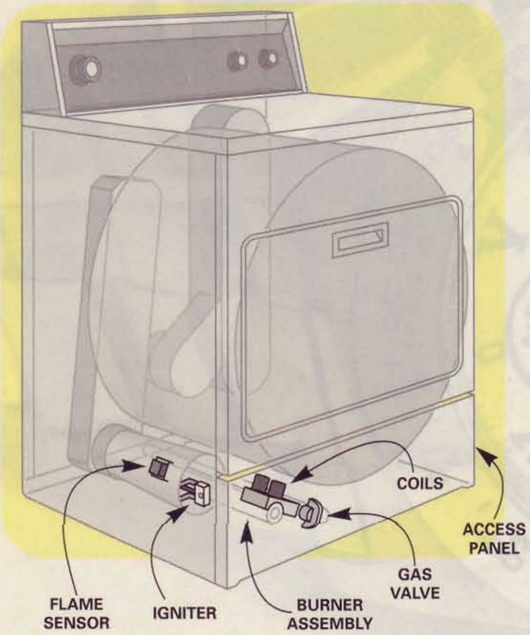
If the circuit to the oven is good, unplug the oven, then unscrew the heating element and pull the connections into the oven compartment (**Photo 1**). Coax the wires through the holes carefully to avoid unplugging or damaging the connections. If the wires have tension on them, clamp them with a clothespin to keep them from being pulled back into the hole. (Don't worry if a wire disappears back into the hole; retrieve it by pulling out the stove and removing the back panel.) Inspect the connections and look for charred, frayed or broken wires. If the terminal connection is bad, replace it (**Photos 1 and 2**). Make sure to buy a special "high-temperature" terminal (available from appliance parts dealers).

If the connections are good, the heating element might be burned out. Test the element with a multimeter (about $15 at home centers and hardware stores) as shown in the bottom left photo or take the heating element to an appliance parts store for testing.

Installing a new element is straightforward. Simply connect the wires to it, slide them carefully back into the holes and screw the element to the back of the oven.

Problem: Gas dryer won't heat

Figure C Gas dryer



Solutions:

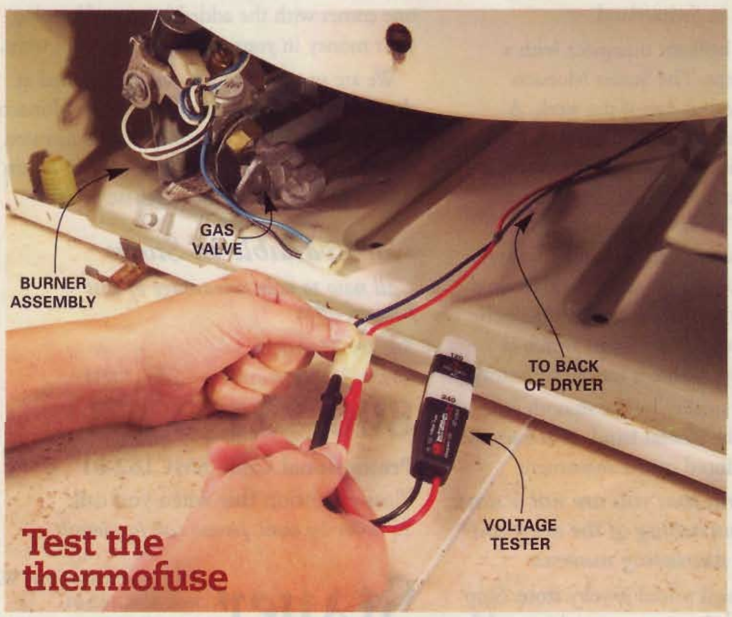
If your gas dryer isn't heating enough to dry your clothes, first try the simple solutions. Clean the lint screen by washing it in hot soapy water to remove invisible fabric softener buildup. Clogged air passages may cause the dryer to shut down. Also check to make sure the vent isn't clogged with lint where it exits through the wall. Finally, clean out the vent pipe by running a plumber's snake through the outside vent to the dryer opening. Tie a rag on the snake and pull it back through the vent to remove lint buildup.

If your dryer still doesn't heat, make sure the gas valve is open (handle parallel to pipe) and that the dryer is plugged in and getting power. Then follow the steps shown in the photos on pp. 84-86. In most cases, one of these repairs will solve the problem. All the repairs we show are simple. You remove a screw or two and plug in a new part. The trick is figuring out which part to replace.

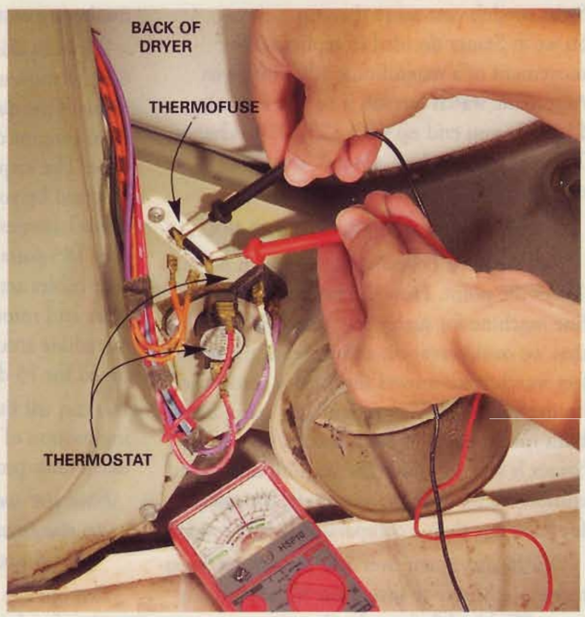
Start by removing the round plug on the front of the dryer or front access panel. Pull out on the lower corners of the panel to remove it. Some panels are held on by screws. Then, with the dryer plugged in and turned on, observe the igniter for clues (**Figure C** and **Photos 2 and 3**, p. 85). Normally the igniter heats up and glows, igniting the gas burner.

If the igniter doesn't heat up:

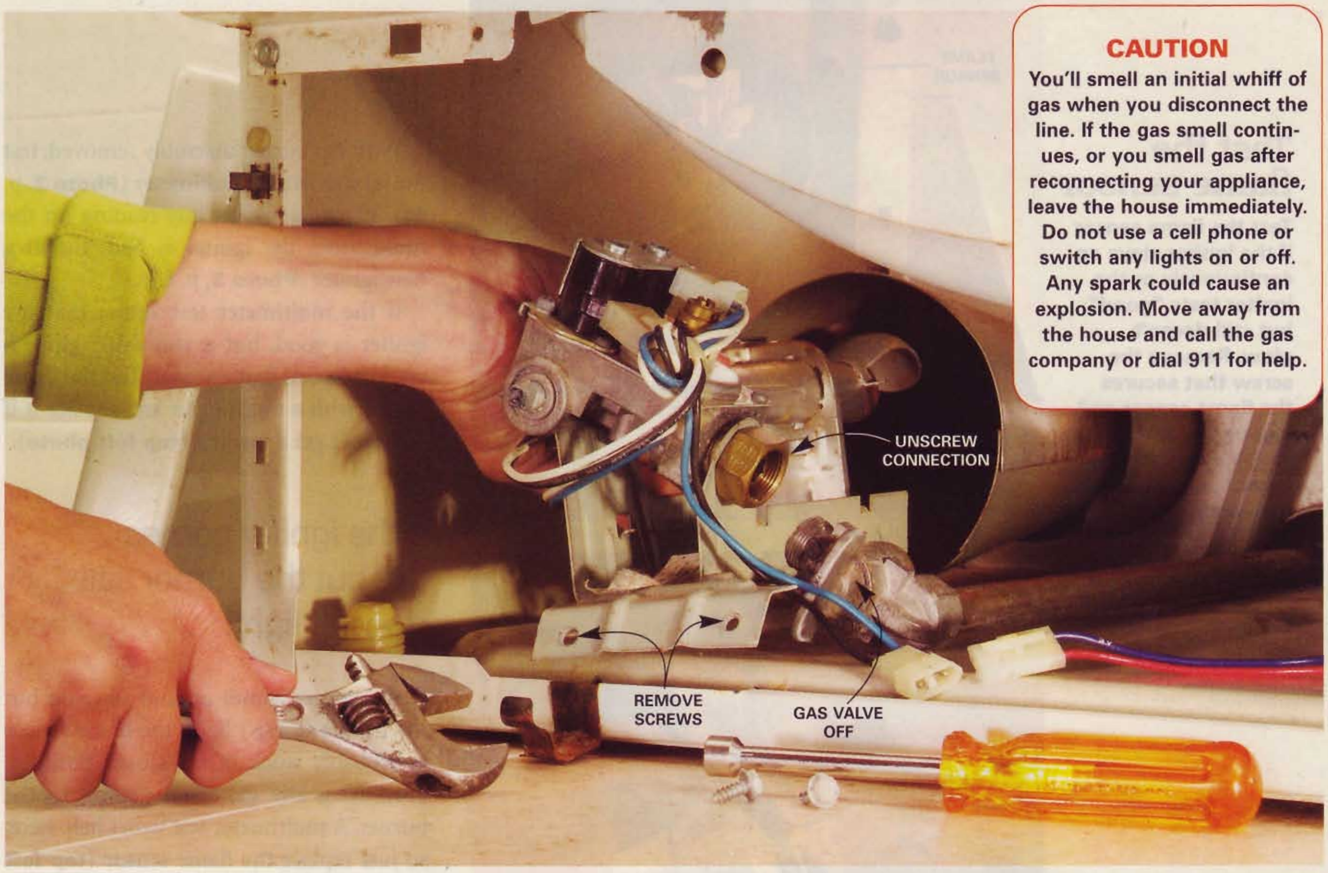
First test for a burned-out **thermofuse.** The thermofuse is a safety device that shuts off power to the burner if the dryer overheats. When the thermofuse burns out, it must be replaced. With the dryer plugged in and turned on, test for power to the burner (**Photo 1**). If there's no power, unplug the dryer and pull it away from the wall and remove the back panel. If you have a flexible gas connection, you may be able to avoid disconnecting the gas. Otherwise shut off the gas valve and



1 Unplug the dryer and disconnect the wires leading from the back of the dryer to the burner assembly. Plug the dryer back in and turn it on. Press the leads of a voltage tester into the two terminals. If the tester doesn't light, test the thermofuse (Photo 2).



2 Unplug the dryer and disconnect the two wires from the thermofuse. Set the multimeter to RX-1 and place the leads onto each terminal. If you don't get any reading on the dial, replace the thermofuse.

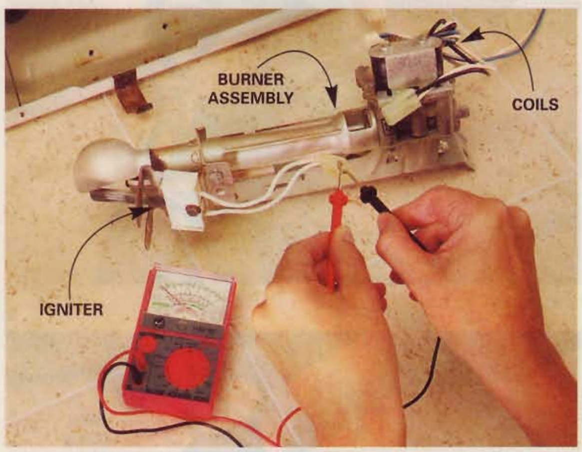


CAUTION

You'll smell an initial whiff of gas when you disconnect the line. If the gas smell continues, or you smell gas after reconnecting your appliance, leave the house immediately. Do not use a cell phone or switch any lights on or off. Any spark could cause an explosion. Move away from the house and call the gas company or dial 911 for help.

disconnect the gas line where it enters the dryer. Then directly test the thermofuse (**Photo 2**, p. 84) and replace it if needed. Also look for a charred thermostat and burned connections at the thermostats and if you see any, replace the thermostats, too. Reassemble the dryer and test it. Replacing the thermofuse or bad thermostats should correct the no-power problem. If not, call a repair service.

Second, test for a bad **igniter**. If the test in **Photo 1** (p. 84) shows there's power to the burner but the igniter isn't glowing, the problem could be a bad igniter. The igniter is easier to test and replace if you remove the entire burner assembly. If you don't feel confident working with gas, call a repair service for this repair. Turn off the gas to the dryer and shut off the gas valve located near the burner (see **Photo 1**). Make sure the dryer is unplugged. Then unscrew the large nut that connects the burner to the gas valve. Remove the two screws in front that hold the burner assembly in place. There's one additional screw under the burner that you may have to loosen or remove.





Test the igniter

1 First turn off the gas to the dryer and shut off the gas valve near the burner. Then unscrew the large nut, remove two or three screws, and lift out the burner assembly.

2 Disconnect the igniter wires. Set the multimeter to RX-1 and touch the tips of the probes to the two igniter leads. If you don't get a reading, the igniter is bad.

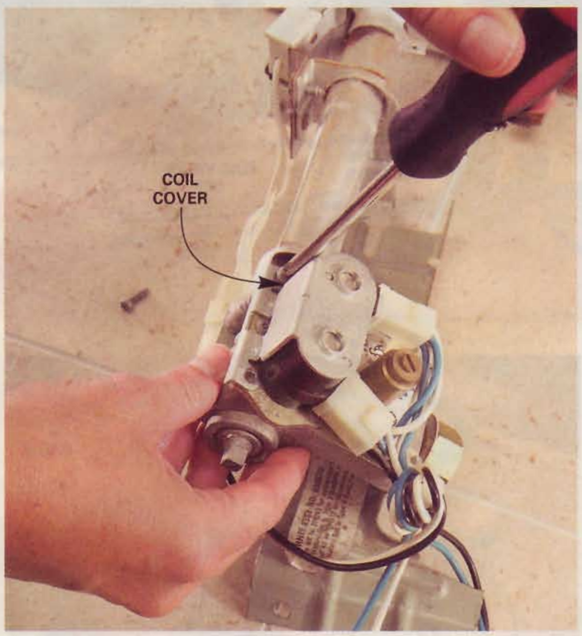
3 Loosen the screw that holds the bad igniter and slide it out. Slide the new one in, being careful not to touch the charcoal-colored part with your fingers. Tighten the screw gently. Reinstall the burner and plug in the wires.

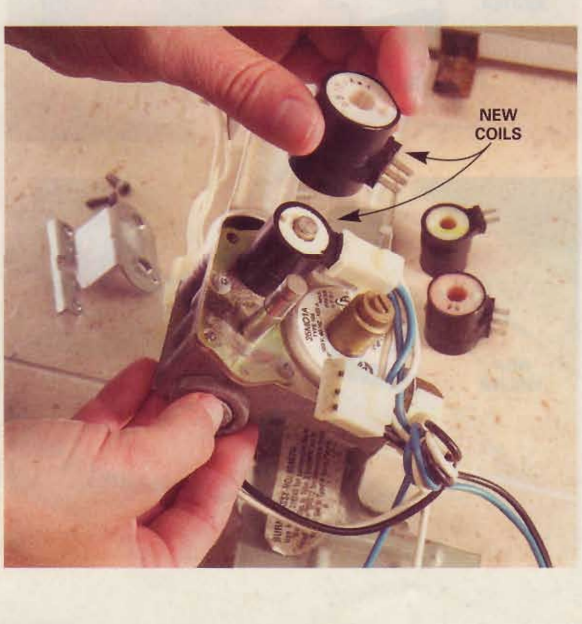
Gas dryer won't heat



Test the flame sensor

Test the flame sensor if the igniter stays on continuously or the igniter tests "good" but still doesn't glow. Remove the screw that secures the flame sensor and unplug the wires. Install a new flame sensor and connect the wires.





Replace the coils

1 Remove the two screws that secure the metal cover and lift off the cover. Unplug the wires and lift out the old coils.

2 Drop the new coils over the metal posts and reconnect the wires. Reinstall the metal cover.

With the burner assembly removed, test the igniter with a multimeter (**Photo 2**, p. 85). If you don't get any reading on the multimeter, the igniter is bad. Install a new igniter (**Photo 3**, p. 85).

If the multimeter test shows that the igniter is good, but it still won't glow, it could be a bad flame sensor. Test the flame sensor with a multimeter and replace it if you don't get a reading (**top left photo**).

If the igniter comes on, but the burner still doesn't light:

If the igniter comes on and stays on but the burner doesn't light, the flame sensor is probably stuck in the closed position, preventing any gas from getting to the burner. A multimeter test won't help here, so just replace the flame sensor (**top left photo**). Unplug the dryer for this repair.

Finally, if the igniter comes on for about 30 seconds and then shuts off and there's no flame, it could indicate bad coils. The coils are electromagnets that open the gas valves when the igniter heats the flame sensor. Usually you can hear the coils click when the igniter comes on. If the igniter comes on and glows but you don't hear a click and the burner won't light, then replace the coils (**Photos 1 and 2**).

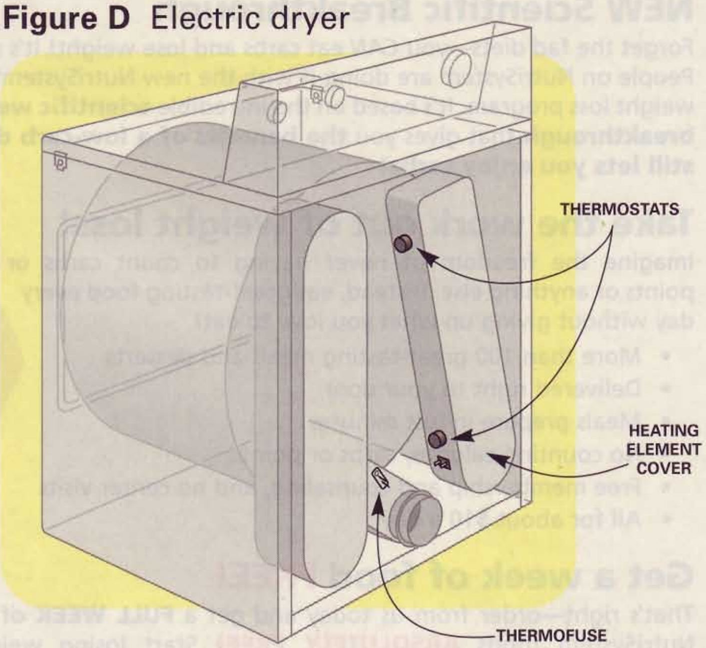
For all these fixes, when you find the problem part, remove it and take it with you to the appliance parts store to buy the correct replacement.

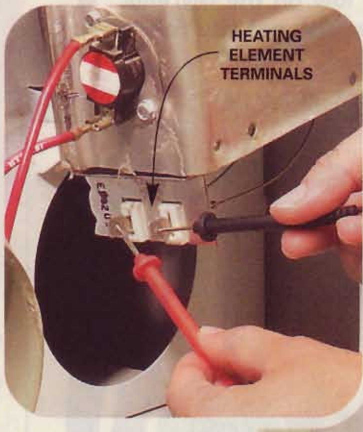
Then, after making the necessary repairs, reinstall the burner assembly. Firmly tighten the nut connecting the burner to the gas valve. Then open both gas valves and test for leaks at the burner/valve joint by swabbing on a solution of 1/2 teaspoon of dishwashing liquid to 1 cup of water. Watch for bubbles, which indicate a leak. If you see bubbles or smell gas, tighten the connection and retest. If this doesn't solve the problem, shut off both valves and call the gas company or an appliance repair service for help.

Problem:

Electric dryer won't heat

Figure D Electric dryer







Test the heating element

Unplug the dryer, open the back, disconnect the heating element wires and test the heating element with a multimeter. If you don't get a reading, the heating element is bad.

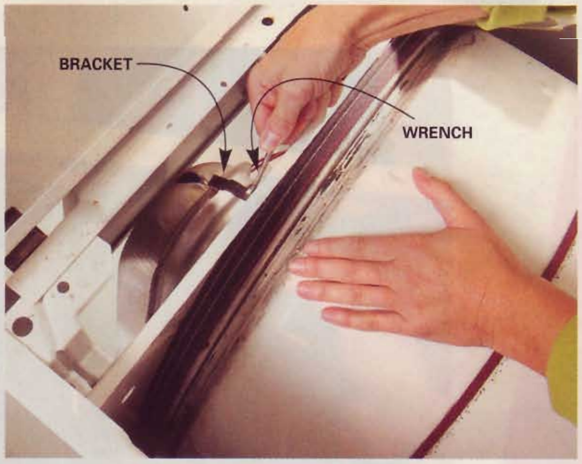
Solutions:

First check to make sure the dryer circuit breaker isn't tripped and that you're getting power to the dryer. If resetting the circuit breaker doesn't solve the problem, the next step is to test the thermofuse. Unplug the dryer and pull it away from the wall. Unscrew the metal cover on the back and remove it. The thermofuse is located on the back of the dryer (see **Figure D** and the bottom photo on p. 88). Test the thermofuse (see **Photo 2** on p. 84) and replace it if it's bad. Also visually inspect the thermostats for signs of burning or bad connections and replace them if they look bad.

If you don't find any other problems, test the heating element (bottom photo, p. 88). If you don't get any reading, replace it (**Photos 1 – 3**). New elements cost $20 to $50. The Kenmore dryer shown requires you to lift the top to reach the bracket that holds the heating element cover on. Some newer models don't require this step. Most Kenmore and Whirlpool dryers look like the dryers shown, but if you have another brand, the heating element will be in a different location. Testing and installing these elements is similar.

Art Direction • DAVID SIMPSON
Photography • MIKE KRIVIT
Technical Art • MARIO FERRO
Consultant • COSTAS STAVROU



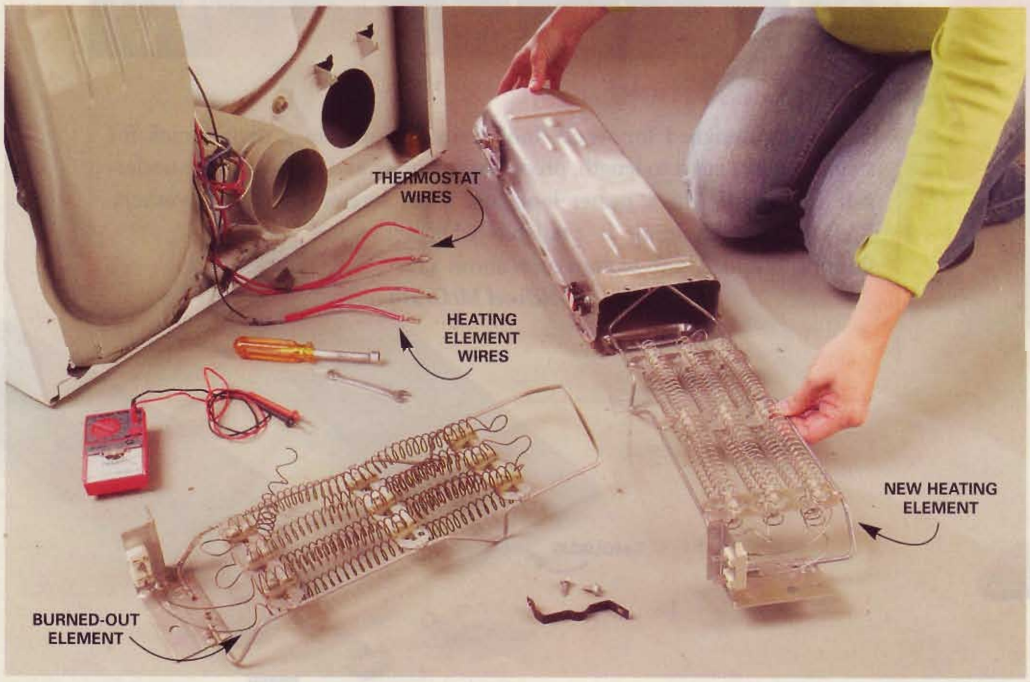


Replace the heating element

1 **Unscrew the two screws that hold the lint catcher to the top. Then slide a stiff putty knife under the front corners and lift to unhook the lid. Tilt it up to expose the top bracket of the heating element compartment.**

2 **Unscrew the top bracket from the dryer frame and remove the bracket.**

3 **Lift out the metal heating element enclosure. Remove the screw that secures the element and unplug the four wires. Slide the element out of the enclosure. Install the new heating element in the reverse order. Reinstall the top bracket, lower the lid and reinstall the two screws into the lint catcher.**



HandyHints®

FROM OUR READERS





Low-cost intercom

If a member of your household hangs out in the workshop, install a wireless doorbell ($15 to $25) as a paging system. Then you can stop making those trips to the workshop when there's a phone call or a missed dinner date. You'll find wireless doorbells at home centers and hardware stores. Be sure to check the range before you buy. Some transmitters have a working range of 300 ft., others less than 100 ft.

Tony Zupancic



Wine glass molding

T-molding designed for wood floor transitions makes a perfect rack for stemware. Just cut it to length, predrill screw holes and screw it to the underside of a shelf. For a neater look, use brass screws and finish washers. Prefinished T-molding is available wherever wood flooring is sold. A 4-ft. section costs about $25.

Michael McGrath





Self-sealing paint cans

Store paint cans upside down and the paint itself will form an airtight seal around the rim. Make sure the cover is on tight to prevent leakage. Hold the can upright and shake it vigorously before you open it so the solids in the paint drop off the lid.

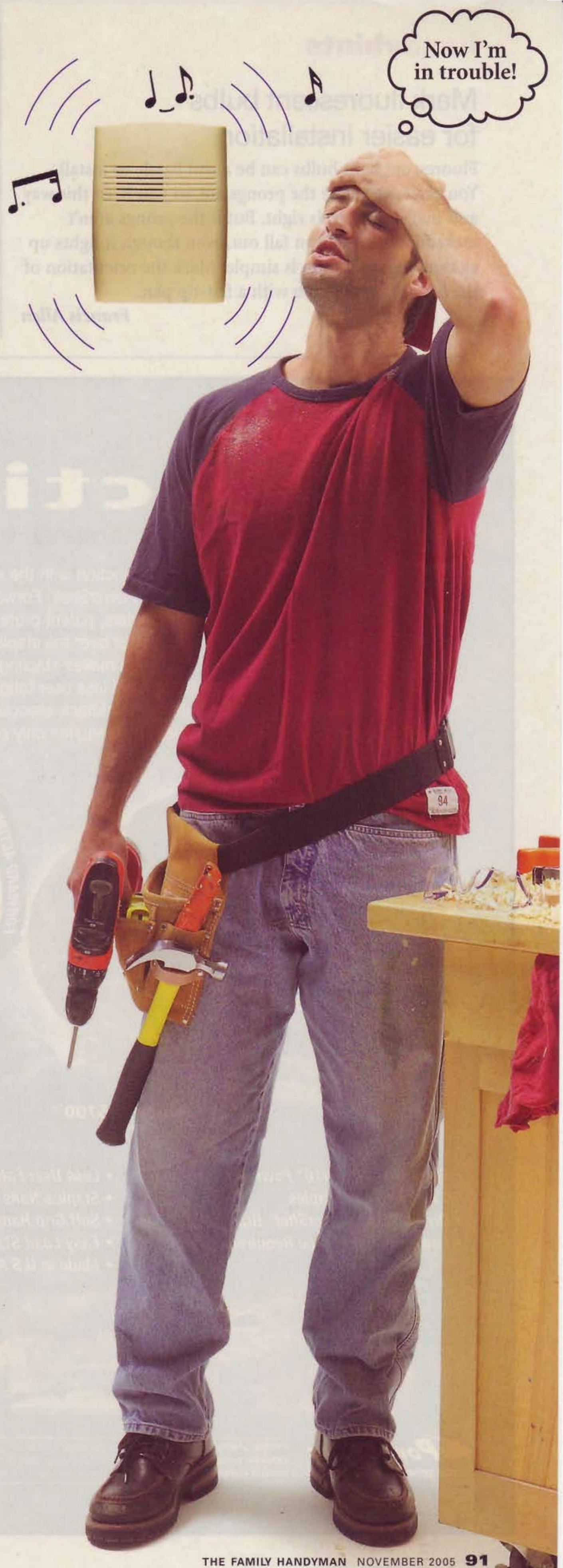
Andy Smith



Bucket flush

You don't have to run to the neighbor's bathroom during a plumbing project. Before you turn off the water supply, fill 2-gallon buckets with water. Flush the toilet by dumping the water in the bowl. You'll get one flush per bucket. Works just as well as the usual method, although it won't refill the bowl.

Bonnie Katovich



Mark fluorescent bulbs for easier installation

Fluorescent light bulbs can be a real hassle to install. You can't see where the prongs are, so you twist this way and that until it feels right. But if the prongs aren't locked in, the bulb can fall out, even though it lights up as usual. The solution is simple: Mark the orientation of the prongs on the bulb with a felt-tip pen.

Francis Allen





Self-stick paint shield

Glad Press'n Seal plastic wrap ($4 at discount stores) goes on fast and stays right where you put it. Paint can seep under the edges, though, so it's no substitute for masking tape in spots where you need a sharp edge.

Holly Schneider



Nail starter

When you need to start a nail in a high spot, extend your reach by pushing the nail through a piece of cardboard or heavy paper. This trick also works in tight spots where your hands won't fit. It even prevents finger bashing when you're starting small nails.

Angela Berryman

WE PAY $100 FOR TIPS

If you have a hint you'd like to share, send it to Handy Hints®, The Family Handyman, 2915 Commers Drive, Suite 700, Eagan, MN 55121. Original contributions become our property upon acceptance and payment. We're sorry, but tips can't be returned.

Editor • GARY WENTZ
Art Direction • LISA PAHL KNECHT
Photography • BILL ZUEHLKE







Brush-on bed liner

Save hundreds of dollars by doing it yourself

by Bob Lacivita and David Radtke

Whether you have a factory-perfect pickup bed you're anxious to protect or a scratched and dented bed you're dying to hide, you have several options for bed liners. Molded drop-in types are sized for your truck and cost $200 to $5,000. Other options are a professionally installed spray-on liner, which costs $500 to $600, or a do-it-yourself roll-on bed liner for only $130 (including tape and cleaners), which is what we'll focus on here.

All liners have their obvious pros and cons. Molded liners are good at absorbing shocks and hauling gravel or sand but can be slippery. They can also get punctured, which can lead to bed corrosion if water and debris become trapped underneath. On the other hand, spray or roll/brush-on bed liners are a heavy-duty polyurethane mixture that hardens and thoroughly coats the inside of your truck bed. Roll/brush-on liners are skid resistant, but on the downside, they can't be removed and aren't as thick as drop-ins, so they're subject to denting.

The three critical steps for a solid, long-lasting coating are preparation, preparation, preparation. No shortcuts allowed, or you'll end up with a worthless chipping or peeling surface.

What you'll need

- Herculiner kit (about $120; see p. 96). The kit includes 1 gal. of the coating, enough for a 6-ft. bed. Order an additional quart for full-size pickups.
- Roll of 2-in. masking tape (3M Scotch-Blue painter's tape, $7, works well)
- Two disposable paint roller pans ($3)
- Rubber-coated (PVC) gloves ($4)
- Roll of lint-free blue paper shop towels ($2)
- 1 qt. acetone ($6)
- 1 qt. xylene ($6)
- Box of TSP (trisodium phosphate, or TSP substitute, $4)
- Household sprayer ($3)
- Paint mixer for power drill ($2)
- Bucket and stiff brush
- Two additional Scotch-Brite pads ($4)

Preparation

Step 1. Remove the tailgate and set it on sawhorses. Sweep or vacuum dirt and debris from the bed and tailgate. Make sure any drain holes are clear. Scrub both the bed and the tailgate with a strong solution of TSP and water to remove oil, petroleum or wax-based residue. Rinse with plenty of clear water and wipe with a clean rag. Allow to dry thoroughly.

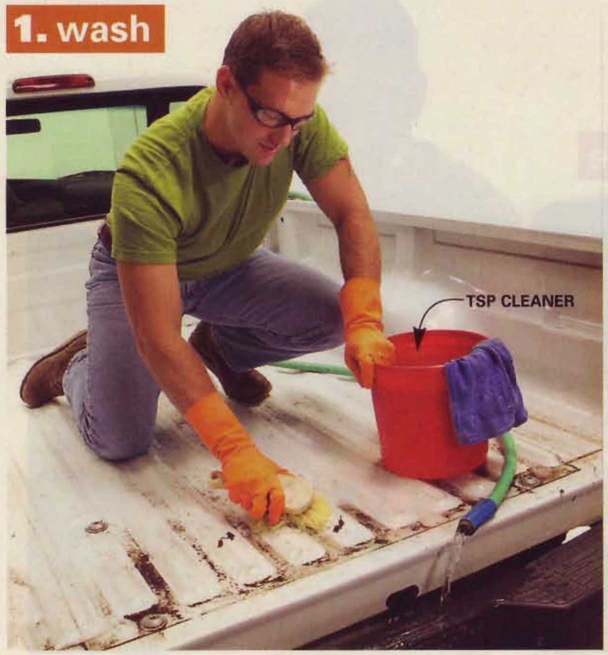


Step 2. Using painter's tape, carefully mask off all areas that aren't going to be covered, especially at the back of the bed near the tailgate. Press the tape down firmly to form a good protective seal. Neatly cover the drain holes with tape or foam rubber weatherstripping to seal them.

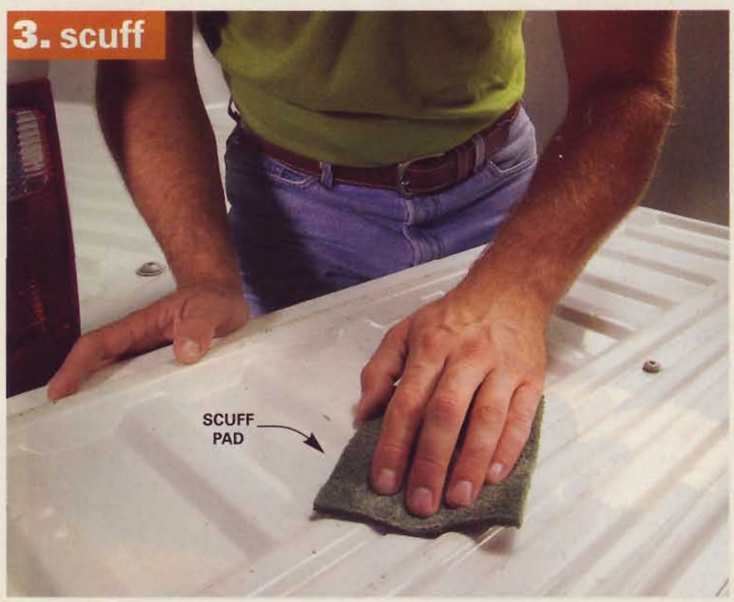
Step 3. Thoroughly scuff all painted surfaces, including any surface rust, to ensure a good bond. Take your time and leave no glossy areas. Sand deep rust or corrosion to the bare metal with 150-grit sandpaper. Blow out or wipe down the bed to remove all

Cleaning products and respirator



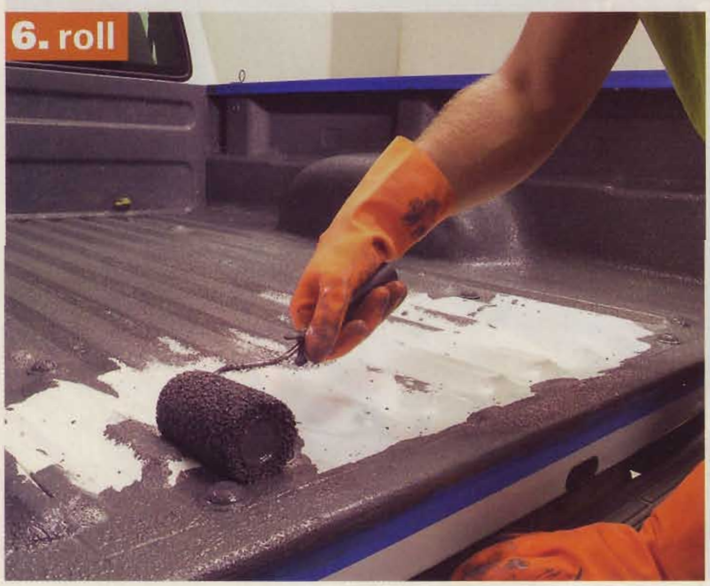












sanding dust. Apply a coat of primer (a good choice is Mar-Hyde primer No. 3510, 4 oz., available at body shop suppliers) and let dry. Don't use lacquer-based primer.

Step 4. Wipe the bed area with acetone. Wear chemical-resistant gloves and a respirator. Start at the front of the bed using the spray bottle. Let the acetone sit for a few seconds and wipe it off with clean shop towels, never using the same side of the towel twice. Wipe the entire surface of the bed where the material is to be applied. Let dry about 10 minutes. (Never use lacquer or alcohol-based solvents.)

Application

Step 5. Remove the lid and thoroughly mix the material using a paint mixer and power drill (make sure the temperature is between 32 and 95 degrees F). The material can be thinned up to 10 percent with xylene if it's too thick to brush or roll. Occasionally stir the mixture while applying. Begin with the seams and corners, dabbing rather than stroking the material into them.

Step 6. Once the seams and corners are covered, use the supplied textured roller cover and handle to gently apply the material to the front and side panels first, then roll the material onto the tailgate and the floor of the trunk bed. Apply a second coat of material along the taped edges before the first coat dries so the tape won't tear when you remove it. Touch up any missed areas with a small brush. When you're finished, discard the roller cover and wrap the brush in a plastic bag to keep it from drying out. Use xylene to remove any excess material while it's still wet. Once the first coat has set up (usually in six hours) or isn't tacky to the touch, apply the second.

Let the rags and application materials air dry, then throw them into the trash. Recycle any leftover materials or solvents as you would oil paint.

Art Direction • DAVID SIMPSON
Photography • BILL ZUEHLKE

Bed liner kit



Herculiner kits are available from J.C. Whitney (800-603-4383, www.jcwhitney.com) and Auto Barn (888-484-9560, www.autobarn.com).

NewProducts

by George Vondriska

Wanna get fresh?

A couple of times a year, a wedding or other special event means I have to put on my Sunday go-to-meetin' clothes. Out comes my suit, looking a little like I'd slept in it. It doesn't need to be cleaned, just freshened up a bit. The Whirlpool Fabric Freshener ($250) is a set-it-and-forget-it way to remove wrinkles and odors without sending clothes to the dry cleaners or getting out the iron.

Closed, the Fabric Freshener is compact and easy to put away. Open, it creates a zippered tent that can house and spruce up two garments at a time. Steam is the key, and using the Fabric Freshener is dirt simple. First, fill the cycle cup with distilled water. The amount of water depends on what type of fabrics you're freshening. The owner's manual has complete instructions for heavy-duty, normal and delicate cycles.

Next hang your garments in the Fabric Freshener, zip it closed and push the "go" button. The Freshener will steam, gently dry and cool your clothes in 30 to 50 minutes. Simple!

The Fabric Freshener (model No. LRF4001RY) is available from Whirlpool.

Whirlpool, (800) 253-1301.
www.whirlpool.com



COLLAPSED FOR STORAGE



OPEN FOR USE



Hey, get a grip!

Does it take a Bionic Wrench to assemble a Bionic Man? If so, you can get one from LoggerHead Tools. The Bionic Wrench ($29), a cross between a pair of pliers and an adjustable wrench, will get a grip on any nut or bolt from 7/16 in. to 3/4 in.

All right, we all know that you should always use the right size wrench or socket. But sometimes the toolbox isn't nearby, or you can't find just the right size, or you need two wrenches of the same size. That's the beauty of adjustable wrenches: One size fits almost all.

The Bionic Wrench has a unique and effective way to grab. The business end holds six piston-like spring-loaded grippers. As you squeeze the handles, the grippers constrict on hexagonal nuts or bolts, with each piston contacting a face. The Bionic Wrench exerts a pretty good grip. Of course, the tighter you can squeeze the handles, the better the Bionic Wrench works, but it doesn't take a bionic hand to make this tool work.

One downside: The head on the Bionic Wrench is large, so you need plenty of clearance to use it.

The Bionic Wrench has earned itself a spot in my kit of just-in-case tools, which is always in my truck. It's available directly from the manufacturer.

LoggerHead Tools, (888) 564-4374. www.loggerheadtools.com





Networked wireless smoke alarms

Building codes for new construction require smoke alarms to be networked. If a fire is detected anywhere in the house, all the alarms will sound. This builds in a great safety factor if you buy a new house. But what do you do in an existing building? It's nearly impossible to pull the wire required to network all your smoke alarms. That's where the new First Alert ONELINK and Kidde Wireless systems pay off. These products simplify alarm networking for fire safety.

Both systems offer battery-powered and 110-volt smoke alarms. Networking, which allows one alarm to send a signal to another alarm, is completely wireless, so there's no need to pull wire to interconnect the alarms. The battery-powered units can be used anywhere in the house. The AC-powered unit can be used to replace 110-volt smoke alarms that aren't networked together, or to supplement a system that is networked.

The First Alert 110-volt alarm (No. SA520CN) costs $55. The battery-operated model, No. SA500CN, costs $45. The Kidde Wireless Smoke Alarm AC-powered unit costs $60, and the battery-powered unit $50.

First Alert products are available at Home Depot. The Kidde Wireless System is available at Lowe's.

First Alert, (800) 323-9005. www.onelinkalarm.com

Kidde, (800) 654-9677. www.kiddeus.com



PHOTOS THIS PAGE COURTESY OF MANUFACTURER



Self-storing touch-up

Argh! Where do these scratches and scuffs on the walls come from? Seems like every time you turn around there's a new one. And it's such a pain to haul out the paint can, roller tray and roller for such a small job, and then have to clean all that gear. Forget about all the paraphernalia. Just grab your new buddy. The Rubbermaid Paint Buddy, that is. This little $10 addition to your painting arsenal is so convenient and easy to use that you'll be hoping the walls get scuffed.

Here's the deal. After you paint a room, pour a little leftover paint into the Paint Buddy (funnel included). Label the self-adhesive sticker so you know what room the paint belongs to, and attach it to the Paint Buddy. Now when you need to do a small touch-up, just grab your Buddy. A roller is built in, so all you have to do is give the Buddy's body a squeeze and you're ready to roll. When you're done, snap the roller out, wash it clean, and you're ready for the next touch-up. An airtight valve in the Paint Buddy keeps the paint fresh for the next round.

The Paint Buddy is available at home centers and hardware stores.



Rubbermaid, (877) 748-7546.
www.paintbuddy.com

Tiles that'll bring smiles



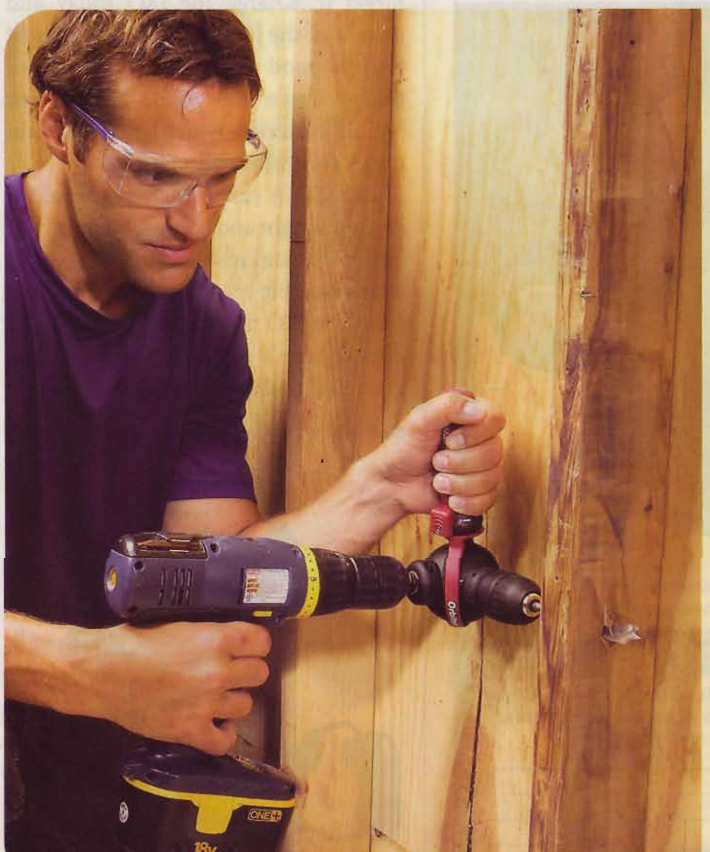
Want to make your kitchen or bathroom a place that's truly your own? What if you could have a tile mural of your favorite scene? Maybe you'd actually look forward to washing dishes if the tile behind the sink took you back to the mountain valley where you spent your vacation. It's possible with Tilepix custom tiles, which are available from Imageworks.

For $33.50 per square foot, you can get your favorite photo permanently printed on a single tile or on a wall of tiles. Multiple tile printing can be used to make a wall mural. It's like assembling a large jigsaw puzzle, with a portion of the image printed on each of the tiles. Images can be printed on a variety of tile sizes, from 4-1/4 in. square up to 8 x 10 in.

Imageworks can handle nearly any image. The company has successfully made tile murals as large as 5-1/2 x 11 ft., starting with an 8 x 10-in., 300 dpi (dots per inch) image. If you want a mural larger than that, the staff can scan the image for you at no extra charge. In either case, once you've proofed and approved the image, it only takes Imageworks about five business days to make your tiles.

The image is permanently printed on good-quality ceramic tile using a laser process. The tiles can be purchased directly from Imageworks.

Imageworks, (503) 843-3386.
www.tilepix.com



Tight drilling



Sometimes you just can't fit a drill and bit into the spot where you need to drill a hole, like in stud and joist pockets. If space is tight, you need a Milescraft Orbiter, ($30). The Orbiter is more than just a right-angle attachment for your drill. It's an *any-angle* attachment.

The spherical head of this unique tool is separated into halves. The drill chuck is attached to one half, and the hex shank that goes into your drill is attached to the other. Each half moves independently, so you can dial an infinite number of combinations between the hex shank and the drill chuck. The handle has two jobs. It gives you a comfortable grip on the Orbiter and locks the two sphere halves in place once they're set to the angle you want.

The keyless chuck on the Orbiter accepts bit shanks up to 3/8 in. in diameter. I've drilled lots of holes in both wood and metal without any slippage. With the Orbiter, there's never a space that's too tight for you and your drill. It's available at Lowe's.

Milescraft, (815) 874-2400.
www.milescraft.com



Cordless, compact, convenient screwdriver

Sometimes using a big cordless drill seems like using a backhoe to pull out a tooth. The dainty screws involved in most household tasks just don't require a lot of driving oomph. That's where the Skil iXO Cordless Palm Size Screwdriver ($50) comes in. It's got enough guts to fasten curtain rod brackets to the wall, tighten loose hinges and even assemble the knock-down furniture that's so common now.

Unlike most other cordless drills, the iXO has a lithium-ion, not a nickel cadmium, battery. So you can charge it and forget it. Charge the iXO today and leave it in the junk drawer, and it'll still have a good charge six months (or more) down the road. Not so for NiCad batteries, which tend to drain down even when idle.

The iXO is surprisingly powerful for its light weight and compact size. It runs in forward and reverse, and comes with a 34-piece bit set, charger and storage case. The iXO is not variable speed and doesn't have a clutch, but it still works great. It's available at Home Depot.

Skil, (877) 754-5999. www.skil.com





No smells, no how

My wife and I have a hobby farm with chickens, sheep, horses and two dogs. Unlike the rest of the livestock, the dogs live in the house. Every once in a while they get into something they shouldn't and lumber inside bringing a barnyard smell we could do without. So when I heard that AtmosKlear could be spritzed directly on a dog, I had to try it. The results were amazing, and we no longer have to banish our best friends to the basement.

AtmosKlear, $8 for 16 oz., has no smell of its own. It doesn't leave your room (or dog) smelling like flowers, cinnamon or incense. What the odorless formula does is eliminate, not cover up, a myriad of smells. The formula is an oxidizer. It must contact the odor source in order to work. From pets to tobacco to general household odors to smelly carpet in your car, this stuff works great. It's biodegradable, non-toxic and, according to the manufacturer, creates no problems for people sensitive to chemical air fresheners.

Here's a neat trick. Spritz AtmosKlear onto your furnace filter and turn on the furnace fan. You'll freshen *the whole house.*

AtmosKlear (No. 003040104) is available at Target.

TwinStar Industries, (800) 977-4145 www.atmosklear.net

Editor • TRAVIS LARSON
Art Direction • EVANGELINE EKBERG
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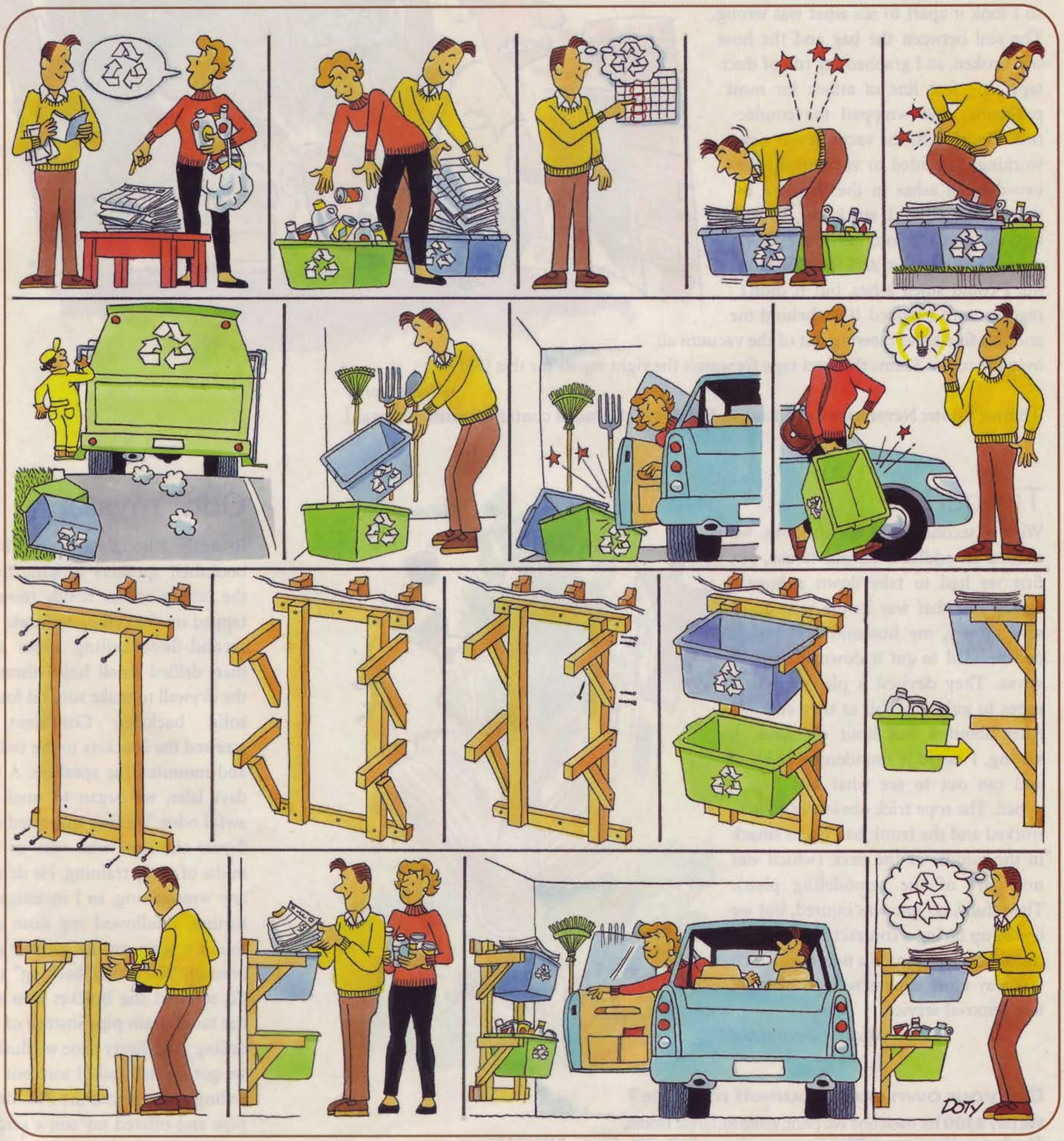
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(signed) Christopher Gaydos, Director, Circulation Planning

Wordless Workshop™

Recycling Rack

by Roy Doty



Our thanks go to Michael McCoy, Sugarland, TX, for this idea.

We'll pay $100 for any ideas published, so send in those sketches and notes!

Submit your idea to Wordless, The Family Handyman, 2915 Commers Drive, Suite 700, Eagan, MN 55121.

Only ideas we purchase can be acknowledged. Original contributions become our property upon acceptance and payment.

GreatGoofs®

Duct tape disaster



My old vacuum cleaner lost its suction, so I took it apart to see what was wrong. The seal between the bag and the hose was broken, so I grabbed my roll of duct tape (my first line of attack for most problems) and wrapped the connection. Happy that the vacuum was now working, I decided to vacuum up the two-day-old ashes in the fireplace in the living room. I stuck the nozzle into the pile and in no time the ashes started to disappear. As I was finishing up, I could smell ashes, but it didn't register until I looked 10 ft. behind me and saw fine ashes blowing out of the vacuum all over the room. Seems the duct tape fix wasn't the right repair for this job!

— John Norby

[Editor's note: Never vacuum up ashes. Put them in a metal container until disposal.]

Timber!



With a second child on the way, we needed an addition on our house, but first we had to take down a huge maple tree that was in the way. To save money, my husband and his dad decided to cut it down themselves. They devised a plan with ropes to guide the fall as they cut. After about a half hour of chain sawing, I heard a thunderous crash and ran out to see what had happened. The rope trick obviously hadn't worked and the trunk had fallen smack in the middle of the deck (which was not part of the remodeling plan). Thankfully, no one was injured, but we ended up hiring a contractor to remove the old deck and build a new one, which was way more expensive than hiring a tree removal service.

— Michele Decouteau

Odor mystery

Recently, I bought a new pair of bookshelf speakers to hang from the ceiling of our family room. I tapped on the ceiling to locate the second-floor ceiling joists and then drilled small holes through the drywall to make sure I'd found solid backing. Confident, I screwed the brackets to the ceiling and mounted the speakers. A few days later, we began to smell an awful odor. We first suspected our 2-year-old son, who was in the midst of potty training. He denied any wrongdoing, so I investigated further. I followed my nose and found a stain on the speaker and bracket. The "solid backing" that I'd screwed the bracket into was the toilet drain pipe instead of the ceiling joist! Every time we flushed we got a small leak. I tore out the ceiling and replaced the PVC drain pipe and offered my son a sincere apology for doubting his training progress.

— Joey Sheat

Got your own do-it-yourself mistake?

We pay **$100** for each one we print. Write to: Great Goofs, The Family Handyman, 2915 Commers Drive, Suite 700, Eagan, MN 55121

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